2nd Edition

C Programming and Coding

Question Bank with Solution

Make Your Coding Strong and Ready to Crack the Technical Interview

SWATI SAXENA

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Second Edition

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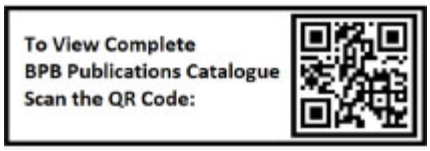

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‘C’ Programming

‘C’ is a general-purpose, powerful computer programming language, supporting structured programming and top-down approach.

It was developed by Dennis Ritchie in 1972 at AT & T Bell Labs. It is used to re-implement the Unix operating system.

It is used to design system software such as operating system and compiler, network devices, and develop application software such as database and spreadsheets. A Unix kernel is completely developed in C language.

The best way we learn anything is by practice and exercise questions. Here are some exercise questions with solutions, specially designed for students’ practice.

Hope, these exercises will help you to improve your coding skills.

All the best!

Preface

C Question Bank with Solution helps you to understand programming and coding with many questions.

This Book Covers all questions that are deemed important for the interview and examination point of you.

By reading this book, you also get knowledge of test case based questions and dynamic memory allocation also.

Although care has been taken for accuracy, the possibility of minor inaccuracies cannot be ruled out. Lastly, thank you to all students who believe in me.

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CHAPTER 1

How to give output?

The *printf()* function, an inbuilt library function in C, is available in C library by default. The function is declared and the related macros are defined in *stdio.h,* a header file in C.

We have to include the *stdio.h* file while using the *printf()* library function in C language.

In C, the *printf()* function is used to print the character, string, float, integer, octal and hexadecimal values onto the output screen.

The syntax of the *printf()* function is: printf("Text");

printf("Format string", variable)

1. Write a program to print message:
   Welcome students, we are trying to learn C

```
#include <stdio.h>
int main()
{
   printf("Welcome students,);
   printf("We are trying to learn C");
   return(0);
}
```

2. Write a program to print your name and phone number:
   Name: XXX
   Phone: 99-999-99999

```
#include <stdio.h>
int main()
{
```

```
    printf("Name:\t XXX\n");
    printf("Phone:\t 99-999-99999\n");
    return(0);
}
```

3. Write a program to print the first letter of your name, for example, F:

```
#include <stdio.h>
int main()
{
    printf("******\n");
    printf("*\n");
    printf("*\n");
    printf("******\n");
    printf("*\n");
    printf("*\n");
    printf("*\n");
    return(0);
}
```

4. Write a program to print following:

```
Name  XXX
DOB  : 1\10\2000
Course  : "C"
Institute  : 'Swati Computers'
#include <stdio.h>
int main()
{
    printf("Name\t\t:XXX\n");
    printf("DOB\t\t:1\\10\\2000\n");
    printf("Course\t\t:\"C\"\n");
    printf("Institute\t:\'Swati Computers\'\n");
```

```
    return(0);
}
```

5. Write a C program to declare two integer and one float variables, then initialize them to 23, 56, and 34.6. It then prints these values.

```
#include <stdio.h>
int main()
{
    int x;
    int y;
    float z;
    x=23; y=56; z=34.6;
    printf("x= %d\n",x);
    printf("y=%d\n",y);
    printf("z=%3.1f\n",z);
    return 0;
}
```

6. Write a program to declare a char variable then initialize it with *, then print A.

```
#include <stdio.h>
int main()

{
char g='*';
    printf("%10c",g");
    printf("\n%8c %3c",g,g);
    printf("\n%8c %1c %c",g,g,g);
    printf("\n%8c %3c",g,g);
    return(0);
}
```

7. Write a program to compute the area of a rectangle with height 4 inch and width 8 inch.

```
#include <stdio.h>
int main() {
int width;
int height;
int area;
   height = 4;
   width = 8;
   area = height * width;
   printf("\nArea of the rectangle = %d square inches ", area);
return(0);
}
```

CHAPTER 2

Basic input and output

The *scanf()* function allows you to accept input from standard input, that is, the keyboard.

The syntax for *scanf()* is:

scanf("format string", & variable);

Format specifier	Description
%d	Integer format specifier
%f	Float format specifier
%c	Character format specifier
%s	String format specifier
%u	Unsigned integer format specifier
%ld	Long int format specifier

8. Write a program to compute the area and circumference of a circle with a radius 4 inch.

```
#include <stdio.h>
int main() {
   int radius;
   float area, circ;
   radius = 6;
   circ = 2*3.14*radius;
   printf("Circumference of the Circle = %f inches\n", circ);
      area = 3.14*radius*radius;
```

```
    printf("Area of the Circle = %f square inches\n", area);
    return(0);
}
```

9. Write a program to prompt the user to input their age and print.

```
#include <stdio.h>
int main()
{
    int age;
    printf("Enter your age:");
    scanf("%d",&age);
    printf("You are %2d years old",age);
    return 0;
}
```

10. Write a program to prompt the user to input two numbers and calculate their addition, subtraction, multiplication, and division.

```
#include <stdio.h>
int main()
{
    int n1,n2,ad,sub,multi,divi;
    printf("Enter 2 numbers:");
    scanf("%d%d",&n1,n2);
        ad=n1+n2;
sub=n1–n2;
multi=n1*n2;
divi=n1/n2;
    printf("\nAddition=%d\nSubtraction=%d",ad,sub);
    printf("\nMultiplication=%d\nDivision=%d",multi,divi);
    return 0;
}
```

11. Write a program to input marks of three subjects and calculate the total and percentage.

```
#include <stdio.h>
int main() {
int eng,maths,science; float total, percentage;
printf("Enter marks of English, math, science, maximum 100 in each\n");
scanf("%d%d%d",&eng,&math,&science);
total=eng+math +science;
percentage=total/300*100;
printf("\nTotal marks obtained=%d",total);
printf("\nPercentage scored =%f",percentage);
return(0);
}
```

12. Write a program to convert specified days into years, weeks, and days (ignore leap year).

```
#include <stdio.h>
int main()
{
   int days, years, weeks;
   days = 1329;
   // Converts days to years, weeks and days
   years = days/365;
   weeks = (days % 365)/7;
   days = days–((years*365) + (weeks*7));
   printf("Years: %d\n", years);
   printf("Weeks: %d\n", weeks);
   printf("Days: %d \n", days);

   return 0;
```

```
}
```

13. Write a program to convert a given integer (in seconds) into hours, minutes, and seconds.

```
#include <stdio.h>
int main() {
   int sec, h, m, s;
   printf("Input seconds: ");
   scanf("%d", &sec);
   h = (sec/3600);
   m = (sec – (3600*h))/60;
   s = (sec – (3600*h)–(m*60));
   printf("H:M:S –%d:%d:%d\n",h,m,s);
   return 0;
}
```

14. Write a program to calculate the speed of bike, when the distance and time are given by the user.

```
#include <stdio.h>
int main() {
   float distance,time,speed;
   printf("Input distance and time taken to travel");
   scanf("%f%f", &distance,&time);
   speed=distance/time;
   printf("\nSpeed calculated : %f",speed);
   return 0;
}
```

15. Write a program that converts a temperature from Centigrade into Fahrenheit.

```
#include <stdio.h>
int main() {
```

```
float temp_f;    /* degrees fahrenheit */
float temp_c;    /* degrees centigrade */
   printf("Input a temperature (in Centigrade): ");
   scanf("%f", &temp_c);
   temp_f = ((9.0 / 5.0) * temp_c) + 32.0;
   printf("\n%f degrees Fahrenheit.\n", temp_f);
   return(0);
}
```

16. Write a program that converts kilometers per hour into miles per hour.

```
#include <stdio.h>
int main()
{
float kmph;  /* kilometers per hour */
float miph;    /* miles per hour (to be computed) */
   printf("Input kilometers per hour: ");
      scanf("%f", &kmph);
   miph = (kmph * 0.6213712);
   printf("\n%f miles per hour\n", miph);
   return(0);
}
```

17. Write a program to input two numbers and interchange their values without using any third variable.

```
#include <stdio.h>
int main()
{
int a,b;
printf("enter 2 numbers");
scanf("%d%d",&a,&b);
```

```
a=a+b; b=a–b;
a=a–b;
Printf("\nAfter Swaping a=%d and b=%d",a,b);
return(0);}
```

18. Write a program to calculate simple interest when P, R, and T are given by the user.

```
#include <stdio.h>
int main()
{
   float principle, time, rate, SI;
       /* Input principle, rate and time */
   printf("Enter principle (amount): ");
   scanf("%f", &principle);
   printf("Enter time: ");
   scanf("%f", &time);
   printf("Enter rate: ");
   scanf("%f", &rate);
   SI = (principle * time * rate) / 100;
   printf("Simple Interest = %f", SI);
   return 0;
}
```

19. Write a program in C to calculate the sum of three numbers to obtain input in one line separated by a comma.

```
#include<stdio.h>
int main()
{
int num1,num2,num3;    /* declaration of three variables */
int sum;
char line_text[50];      /* line of input from keyboard */
```

```
    printf("Input three numbers separated by comma : ");
        fgets(line_text, sizeof(line_text), stdin);
        sscanf(line_text, "%d, %d, %d", &num1, &num2, &num3);
    sum = num1+num2+num3;
    printf("\nThe sum of three numbers : %d\n", sum);
    return(0);
}
```

20. Write a program to input the quantity of pens and price of each pen purchased, and calculate the total amount payable.

```
#include<stdio.h>
int main()
{
int qty_pen;
float amt,price_pen;

    printf("Enter quantity and of pen and price of 1 pen : ");
        scanf("%d%f",&qty_pen,&price_pen);

amt=qty_pen * price_pen;
    printf("\nAmount Payable=%f",amt);
    return(0);
}
```

21. Write a program to calculate the total salary when the basic salary is given by the user and calculate HRA, DA, and TA.

```
#include<stdio.h>
int main()
{
float total,Basic,HRA,TA,DA;
    printf("Enter basic salary : ");
```

```
    scanf (“%f”,&Basic);
HRA=Basic *10/100;
TA= Basic *8/100;
DA=Basic * 5/100;

Total= Basic +HRA +DA +TA;
    printf(“\nTotal Salary = %f”,total);
    return(0);
}
```

22. Write a program to calculate the amount payable after 10% discount on purchase in a sale.

```
#include<stdio.h>
int main()
{
float amt, PR, dis;
    printf(“Enter Purchase Rate : “);
    scanf (“%f”,&PR);
dis=PR*10/100;
amt=PR–dis;
    printf(“\nAmount Payable = %f”,amt);
    return(0);
}
```

CHAPTER 3

Using the ternary statement

Using *?:* reduces the number of lines of codes and improves the performance of an application.

Its syntax is as follows:

expression-1 ? expression-2 : expression-3

In the afore mentioned syntax, *expression-1* is the condition, and *expression-2* and *expression-3* will be either a value or variable or statement or any mathematical expression.

If the condition is true, *expression-2* is executed; otherwise, *expression-3* is executed.

23. Write a program using the ternary operator to check whether a given number is even or odd.

```
#include<stdio.h>
int main()
{
int n;
   printf("Enter a number : ");
       scan(" %d",&n);
(n%2==0)? Printf("\nnumber is even") : printf("\nNumber is odd");
   return(0);
}
```

24. Write a program using the ternary operator to check whether a given number is positive or negative.

```
#include<stdio.h>
int main()
```

```
{
int n;
   printf(“Enter a number : “);
       scan(“ %d”,&n);
(n>0)? printf(“\nnumber is positive”) : printf(“\nNumber is
Negative”);
   return(0);
}
```

25. Write a program using the ternary operator to return greater number out of two numbers.

```
#include<stdio.h>
int main()
{
int a,b,x;
   printf(“Enter two numbers : “);
       scan(“ %d%d”,&a,&b);

x=(a>b) ? a : b;
       Printf(“\nGreater is %d”,x);
   return(0);
}
```

26. Write a program using the ternary operator to check whether the gender is male or female.

```
#include<stdio.h>
int main()
{
char g;
   printf(“Enter Gender M/F : “);
       scan(“ %c”,&g);
```

```
(g=='M')? printf("\nHello Sir") : printf("\nHello mam");
   return(0);
}
```

27. Write a program to check gender is Male/ female use OR operator, using Ternary operator.

```
#include<stdio.h>
int main()
{
char g;
   printf("Enter Gender M/F : ");
       scan(" %c",&g);

(g=='M' || g=='m')? printf("\nHello Sir") : printf("\nHello mam");
   return(0);
}
```

28. Write a program using the OR operator and ternary operator to check whether the gender is male or female.

```
#include<stdio.h>
int main()
{
char g;
   printf("Enter Gender M/F : ");
       scan(" %c",&g);
  (g=='M' || g=='m')? printf("\nHello Sir") : (g=='F' || g=='f')?
 printf("\nHello mam");
   return(0);
}
```

29. Write a program to find the greatest number out of three numbers, using the ternary operator.

```
#include<stdio.h>
int main()
{
int a,b,c;
   printf("enter 3 numbers");
   scanf("%d%d%d",&a,&b,&c);
(a>b)?(a>c)?printf("A is greater"): printf("\nC is greater"):(b>c)?
printf("\nB is greater"):printf("\nC is greater");
   return(0);
}
```

30. Write a program to check whether a person is eligible to vote or not, using the ternary operator (eligibility criterion: age should be more than 18 years).

```
#include<stdio.h>
int main()
{
int age;
   printf("Enter your age ");
       scan(" %d",&age);
(age>=18) ? printf("\nEligible ") : printf("\nNot Eligible");
   return(0);
}
```

CHAPTER 4

Decision-making practice: if-else and switch case

Decision-making is used to specify the order of execution of the statements.

An *if* statement can be followed by an optional *else* statement, which executes when the Boolean expression is false.

The C programming language assumes any non-zero and non-null values as true, and if it is either zero or null, then it is assumed as a false value.

The syntax of an if-else statement is:

```
if(Condition)
{
Statements, if condition is true
 }
  Else
 {
  Statements, if condition is false
   }
```

An if statement can be followed by an optional else if...else statement, which is very useful to test various conditions using a single if...else if statement.

A*s witch* statement allows a variable to be tested for equality against a list of values.

A switch statement can be replaced by an if-else statement.

Its syntax is:

```
switch(expression) {
```

```
    case constant-expression :
    statement(s);
      break; /* optional */
      case constant-expression :

      statement(s);
      break; /* optional */
   /* you can have any number of case statements */
    default : /* Optional */
    statement(s);
}
```

31. Write a program to check whether a character is a vowel or consonant.

```
#include<stdio.h>
int main()
{
char v;
printf("Enter a character ");
scan(" %c",&v);
if(v='a' || v='e' || v='i' || v='o' || v='u')
{
   printf("\nvowel");
}
else
{
   printf("\nConsonent");
}
return(0);
}
```

32. Write a program to find the tallest person between two persons.

```
#include<stdio.h>
int main()
{
int a,b,x;
   printf(“Enter height of 2 persons : “);
       scan(“ %d%d”,&a,&b);
if(a>b)
{
        Printf(“a is greater”);
}
else
{
      Printf(“b is greater”);
}
   return(0);
}
```

33. Write a program to accept two integers and check whether they are equal or not.

```
#include <stdio.h>
void main()
{
   int int1, int2;
   printf(“Input the values for Number1 and Number2 : “);
   scanf(“%d %d”, &int1, &int2);

   if (int1 == int2)
      printf(“Number1 and Number2 are equal\n”);
   else
      printf(“Number1 and Number2 are not equal\n”);
```

```
}
```

34. Write a program to find whether a given year is a leap year or not.

```
#include <stdio.h>
void main()
{
   int chk_year;

   printf("Input a year :");
   scanf("%d", &chk_year);

if ((chk_year % 400) == 0)
   printf("%d is a leap year.\n", chk_year);
else if ((chk_year % 100) == 0)
   printf("%d is a not leap year.\n", chk_year);
else if ((chk_year % 4) == 0)
   printf("%d is a leap year.\n", chk_year);
else
   printf("%d is not a leap year \n", chk_year);
}
```

35. Write a program to change the case of an input char. If it is in capital (upper case), then convert into lower case and vice versa.

```
#include<stdio.h>
int main()
{
char ch;
   printf("Enter a character : ");
       scan(" %c",&ch);
if(ch>=65 && ch<=90)
{
```

```
        ch=ch+32;
}
else
{
        ch=ch–32
}
   return(0);
}
```

36. Write a program to check the greatest number out of three given numbers.

```
#include<stdio.h>
int main()
{
int a,b,c;
   printf(“enter 3 numbers”);
   scanf(“%d%d%d”,&a,&b,&c);
if(a>b)
{
   If(a>c)
  {
        printf(“a is greater”);
  }
else
{
        printf(“c is greater”);
}
}
else if(b>c)
{
```

```
        printf("b is greater");
}
else
{
        printf("c is greater");
}
   return(0);
}
```

37. Write a program to check the greater number out of three given numbers.

```
#include<stdio.h>
int main()
{
int a,b,c;
   printf("enter 3 numbers");
   scanf("%d%d%d",&a,&b,&c);

if(a>b && a>c)
{
   printf("\n a is greater");
}
else if(b>a && b>c)
{
   printf("\b b is greater");
}
else if(c>a && c>b)
{
   printf("\n c is greater");
}
```

```
    return(0);
}
```

38. Write a program to input a grade and display the description.

```
#include <stdio.h>
void main()
{
    char grd;
    printf("Input the grade :");
    scanf("%c", &grd);
    switch(grd)
   {
    case 'E':
    printf( " Excellent");
        break;
    case 'V':
printf( " Very Good");
        break;
    case 'G':
printf( " Good ");
        break;
    case 'A':
printf( " Average");
        break;
    case 'F':
printf( " Fails");
        break;
    default :
printf( "Invalid Grade Found. \n");
        break;
```

```
  }
}
```

39. Write a program to read any day in integer and display the day name in words.

```
#include <stdio.h>
void main()
{
int dayno;
printf("Input Day No : ");
scanf("%d",&dayno);
switch(dayno)
{
   case 1:
       printf("Monday \n");
       break;
   case 2:
       printf("Tuesday \n");
       break;
   case 3:
       printf("Wednesday \n");
       break;
   case 4:
       printf("Thursday \n");
       break;
   case 5:
       printf("Friday \n");
       break;
   case 6:
       printf("Saturday \n");
```

```
        break;
    case 7:
        printf("Sunday \n");
        break;
     default:

        printf("Invalid day number. \nPlease try again
    break;
}}
```

40. Write a program to read any month number in integer and display the number of days for this month.

```
#include <stdio.h>
void main()
{
int monno;
printf("Input Month No : ");
scanf("%d",&monno);
switch(monno)
{
case 1:
case 3:
case 5:
case 7:
case 8:
case 10:
case 12:
    printf("Month have 31 days. \n");
    break;
case 2:
```

```
    printf("The 2nd month is a February and have 28 days. \n");
    printf("in leap year The February month Have 29 days. \n");
    break;
  case 4:
  case 6:
  case 9:
  case 11:
    printf("Month have 30 days. \n");
    break;

  default:
    printf("invalid Month number .\nPlease try again");
    break;
  } }
```

41. Write a menu-driven program to perform a simple calculation.

```
#include <stdio.h>
void main() {
int num1,num2,opt;
printf("Enter the first Integer :");
scanf("%d",&num1);
printf("Enter the second Integer :");
scanf("%d",&num2);
printf("\nInput your option :\n");
printf("1-Addition.\n2-Subtraction.\n3-Multiplication.\n4- Division.\n5-
Exit.\n");
    scanf("%d",&opt);
    switch(opt) {
       case 1:
         printf("The Addition of %d and %d is:
```

```
    %d\n",num1,num2,num1+num2);
    break;
  case 2:
    printf("The Subtraction of %d and %d is:
    %d\n",num1,num2,num1–num2);
    break;
  case 3:
    printf("The Multiplication of %d and %d is:
    %d\n",num1,num2,num1*num2);
    break;
  case 4:
     if(num2==0) {
        printf("The second integer is zero. Divide by zero.\n");
     } else {
        printf("The Division of %d and %d is :
        %d\n",num1,num2,num1/num2);
     }
     break;
   case 5:
        break;

        default:
           printf("Input correct option\n");
           break;
  }
}
```

42. Write a program to calculate the electricity bill of a given customer. The unit consumed by the user should be taken from the keyboard, and display the total amount to be paid by the customer. The charges are as follows:

Unit	Charge/unit
Upto 199	@1.20
200 and above, but less than 400	@1.50
400 and above, but less than 600	@1.80
600 and above	@2.00

If the bill exceeds Rs. 400, then a surcharge of 15% will be charged and the minimum bill should be of Rs. 100.

```
#include <stdio.h>
void main()
{
   float chg, surchg=0, gramt,netamt,conu;
   printf("Input the unit consumed by the customer : ");
   scanf("%d",&conu);
   if (conu <200 )
       chg = 1.20;
   else if (conu>=200 && conu<400)
       chg = 1.50;
   else if (conu>=400 && conu<600)
       chg = 1.80;
else
   gramt = conu*chg;
   if (gramt>300)

       chg = 2.00;
surchg = gramt*15/100.0;
netamt = gramt+surchg;
if (netamt < 100)
netamt =100;
```

```
printf("\nElectricity Bill\n");
printf("unit Consumed: %d\n",conu);
printf("Amount Charges @Rs. %4.2f per unit :%8.2f\ n",chg,gramt);
printf("Surchage Amount: %8.2f\n",surchg);
printf("Net Amount Paid By the Customer: %8.2f\ n",netamt);
}
```

43. Write a program to calculate the profit and loss in a transaction.

```
#include <stdio.h>
void main()
{
   int cprice,sprice, plamt;
   printf("Input Cost Price: ");
   scanf("%d", &cprice);
   printf("Input Selling Price: ");
   scanf("%d", &sprice);
   if(sprice>cprice) //calculate profit
  {
        plamt = sprice–cprice;
        printf("\nYou can booked your profit amount : %d\n", plamt);
  }
   else if(cprice>sprice) //calculate loss
  {
        plamt = cprice–sprice;
        printf("\nYou got a loss of amount : %d\n", plamt);
  }
   else //No Profit No Loss
  {
        printf("\nYou are running in no profit no loss condition.\n");
  }
```

```
}
```

44. Write a program to input a number and print its ASCII-equivlent value.

```
#include<stdio.h>
void main()
{
int n;
   printf("enter a number");
   scanf("%d",&n);
printf("\nascii value for %d is %c",n,n);
}
```

45. Write a program to calculate the amount payable after deducting the discount on the purchase amount.

Discounts are as follows:

Purchase amount >=8,000;

Discount=10% on the purchase amount

Purchase amount >=5,000;

Discount =8% on the purchase amount Purchase amount >=1,000;

Discount =4% on the purchase amount Otherwise;

Discount = Rs. 100

```
#include<stdio.h>
void main()
{
float PR,dis,amount;
   printf("enter purchase rate");
   scanf("%f",&PR);

   If(PR>=8000)
       dis=PR* .10;
```

```
    else if(PR>=5000)
        dis=PR*.08;
    else if(PR>=1000)
        Dis=PR*.04;
    else
    dis=100;

    amount=PR–dis;
    printf("\nAmont payable after %f discount is   %f",dis,amt);
}
```

46. Write a program to calculate the total salary after giving HRA, DA, and TA with the basic salary.

HRA, DA, and TA should be calculated as follows:

Basic salary > =10,000 HRA=8%, DA=7%, TA= 8%

Basic salary > =5,000 HRA=6%, DA=5%, TA= 7%

Otherwise HRA=5%, DA=5%, TA= 7%

```
#include<stdio.h>
    void main()
    {
    float basic_sal, hra,da,ta,total_sal;
        printf("enter basic salary");
        scanf("%f",&basic_sal);
        if(basic_sal >=10000)
        {
        hra=basic_sal*.08;
        da=basic_sal*.07;
        ta=basic_sal*.08;
}
else if(basic_sal >=5000)
```

```
        {
        hra=basic_sal*.06;
        da=basic_sal*.05;
        ta=basic_sal*.07;
}
else
{
hra=basic_sal*.05;
        da=basic_sal*.05;
        ta=basic_sal*.07;
}
total_sal=basic_sal+hra+da+ta;
printf("\nbasic salary=%f \nhra=%f \t da=%f \t ta=%f",basic_
sal,hra,da,ta);
printf("\ntotal salary=%f",total_sal);
}
```

47. Write a program to output a message according to the age and gender.

```
#include<stdio.h>
void main()
{
char gender; int age;
printf("enter gender m/f");
gender=getchar();
printf("enter age");
scanf("%d",&age);
if(gender=='m' || gender=='m')
{
   if(age>=65)
   printf("hello uncle");
```

```
    else if(age>=35)
    printf("hello sir");
    else
    printf("hello young boy");
   }
  else if(gender=='f' || gender=='F')
  {
    if(age>=70)
    printf("hello aunty");
    else if(age>=25)
    printf("hello mam");
    else
    printf("hello baby");
  }
  }
```

48. Enter choice to print\npress 1 for print message\n press 2 for print star \n stop\n");

```
  scanf("%d",&n);
  switch(n)
  {
  case 1:
    goto msg;
  case 2:
    goto star;
  default:
    exit(0);
  }
  msg:
  {
```

```
printf("Hello");
}
star:
{
printf("\n*");
}
}
```

49. Write a program to output one-digit password without showing it at runtime.

```
#include<stdio.h>
#include<conio.h>
void main()
{
char password;
   printf("enter 1 digit password");
   password=getch();
   printf("*");
}
```

CHAPTER 5

Looping/Iteration

Loops are used in programming to repeat a specific block of code for multiple (N) times until some end condition is met.

Loops can be categorized into two types:

- Entry control loop
- Exit control loop

Examples of an entry control loop are the for loop and the while loop. Example of an exit control loop is the do-while loop.

The syntax for the for loop is:

```
for ( variable initialization; condition; variable update )
    {
    Code to execute while the condition is true
    }
```

The syntax for the while loop is while (condition) { Code to execute while the condition is true

```
    }
```

The syntax for the do loop is:

```
    do {
        Code to execute
        } while ( condition );
```

More syntaxes that are not error are:

```
    int i;
for(i=1;;i++){ if(condition) break;}
for(;;){} // infinite loop,but no error
```

```
for(i=1;i<=10&&i>=3;i++){}

for(i=1;i<=10;i++);

while(1){} //infinite loop

while(1){ if(condition)break;}
```

Jumping statements

Jumping statements are used to exit loop / continue in loop / go to a particular position.

Types of jump statements are:

- Break
- Continue
- Goto
- Return

Break

The *break* statement is used inside a loop or a switch statement.

When a compiler finds the break statement inside a loop, it will abort the loop and continue to execute statements followed by the loop.

A *break* statement is used to terminate the execution of the rest of the block where it is present and takes the control out of the block to the next statement. The syntax of the break statement is:

```
for(;;){ if (condition){break;}}
```

Continue

Continue is another keyword that controls the flow of loops. If you are executing a loop and hit a continue statement, the loop will stop its current iteration, update itself (in the case of for loops), and begin to execute again from the top.

Continue is mostly used in loops. Rather than terminating the loop, it stops the execution of the statements underneath and takes control of the next iteration.

The *continue* statement passes the control to the next iteration of the inner loop where it is present and not to any of the outer loops.

The syntax of a continue statement is: for(;;){if(condition){continue;}}

Goto

The *goto* jump statement is used to transfer the flow of control to any desired part of the program.

It jumps from one point to another point within a function.

The syntax of a goto statement is: goto label;

Note: Use of a goto statement is highly discouraged in any programming language because it makes it difficult to trace the control flow of a program, making the program difficult to understand and modify.

Any program that uses a goto statement can be rewritten to avoid it.

Return

The *return* statement is used to terminate the execution of a function and transfer the program control back to the calling function.

The return statement ends the current function and returns control to the point of invocation. It can also return a value in that point.

A function may or may not return a value.

A return statement returns a value to the calling function and assigns to the variable on the left side of the calling function.

If a function does not return a value, the return type in the function definition and declaration is specified as void.

The syntax of a return statement is:

```
return expr ;
```

where *expr* is the expression whose value is returned by the function.

The execution of the return statement causes the expression *expr* to be to be evaluated and its value to be returned to the point from which this function is called.

The expression *expr* in the return statement is optional, and if omitted, the program control is transferred back to the calling function, without returning any value.

50. Write a program to print the seriers 1 to N using the for loop.

```
#include<stdio.h>
void main()
{
int i,n;
   printf("enter value of n");
   scanf("%d",&n);

   for(i=1;i<=n;i++)
  {
   printf("\n%d",i);
}
}
```

51. Write a program to print the square seriers 1 to N using the for loop.

```
#include<stdio.h>
void main()
{
int i,n;
   printf("enter value of n");
   scanf("%d",&n);

   for(i=1;i<=n;i++)
```

```
  {
   printf("\n%d",i*i);
}
}
```

52. Write a program to print the cube seriers 1 to N using the for loop.

```
#include<stdio.h>
void main()
{
int i,n;
   printf("enter value of n");
   scanf("%d",&n);

   for(i=1;i<=n;i++)
  {
   printf("\n%d",i*i*i);
}
}
```

53. Write a program to print the seriers 1 to N, its square, and cube using the for loop.

```
#include<stdio.h>
void main()
{
int i,n;
   printf("enter value of n");
   scanf("%d",&n);

   for(i=1;i<=n;i++)
  {
   printf("\n%d\t%d\t%d",i,i*i,i*i*i);
```

```
}
}
```

54. Write a program to find the even/odd number between 1 to N using the for loop.

```
#include<stdio.h>
void main()
{
int i,n;
   printf("enter value of n");
   scanf("%d",&n);

   for(i=1;i<=n;i++)
   {
   if(i %2 ==0)
   {
       printf("\n%d is even",i);
}
else
{
   printf("\n%d is odd",i);
}
}
}
```

55. Write a program to print a table of the given number.

```
#include<stdio.h>
void main()
{
int i,n;
   printf("enter number");
```

```
    scanf("%d",&n);

    for(i=1;i<=10;i++)
    {
    printf("\n%d*%d=%d",n,i,n*i);
}
}
```

56. Write a program to print the seriers 1,3,5,7,9 N using the for loop.

```
#include<stdio.h>
void main()
{
int i,n;
    printf("enter value of n");
    scanf("%d",&n);
    for(i=1;i<=n*2;i+=2)
  {
    printf("\n%d",i);
}
}
```

57. Write a program to print the seriers 2,4,6,8...N using the for loop.

```
#include<stdio.h>
void main()
{
int i,n;
    printf("enter value of n");
    scanf("%d",&n);

    for(i=2;i<=n*2;i+=2)
    {
```

```
    printf("\n%d",i);
}
}
```

58. Write a program to print the seriers 1,5,2,10,3,15. N using the for loop.

```
#include<stdio.h>
void main()
{
int i,n;
    printf("enter value of n");
    scanf("%d",&n);

    for(i=1;i<=n;i++)
    {
    printf("%d,%d,",i,i*5);
}
Printf("\b ");
}
```

59. Write a program to print the seriers 1,0,1,0,1,0,1,. N using the for loop.

```
#include<stdio.h>
void main()
{
int i,n,x=1;
    printf("enter value of n");
    scanf("%d",&n);

    for(i=1;i<=n;i++)
    {
    printf("%d,",x);
    x=1–x;
```

```
}
printf("\b ");
}
Or #include<stdio.h>
void main()
{
int i,n,x=1;
   printf("enter value of n");
   scanf("%d",&n);

   for(i=1;i<=n;i++)
   {
      if(i%2==0)
      printf("1,");
      else printf("0,");
}
printf("\b ");
}
```

60. Write a program to print the seriers 1,–1,1,–1,1,–1,. N using the for loop.

```
#include<stdio.h>
void main()
{
int i,n,x=1;
   printf("enter value of n");
   scanf("%d",&n);
   for(i=1;i<=n;i++)
  {
   printf("%d,",x);
```

```
    x=x * (–1);
}
printf("\b ");
}
```

Or

```
#include<stdio.h> void main()
{
int i,n,x=1;
    printf("enter value of n");
    scanf("%d",&n);

    for(i=1;i<=n;i++)
    {
        if(i%2==0) printf("1,");
        else printf("–1,");
}
printf("\b ");
}
```

61. Write a program to read 10 numbers from keyboard and find their sum and average.

```
#include <stdio.h>
void main()
{
int i,n,sum=0;
    float avg;
    printf("Input the 10 numbers : \n");
    for (i=1;i<=10;i++)
  {
    printf("Number–%d :",i);
        scanf("%d",&n);
```

```
        sum +=n;
  }
    avg=sum/10.0;
    printf("The sum of 10 no is : %d\nThe Average is :
%f\n",sum,avg);
}
```

62. Write a program to find the lowest common multiple (LCM) of any two numbers.

```
#include <stdio.h>
void main()
{
int i, n1, n2, max, lcm=1;
    printf("\n\n LCM of two numbers:\n ");
    printf("-----------\n");
    printf("Input 1st number for LCM: ");
    scanf("%d", &n1);
    printf("Input 2nd number for LCM: ");
    scanf("%d", &n2);
    max = (n1>n2) ? n1 : n2;
    for(i=max; ; i+=max)
    {
     if(i%n1==0 && i%n2==0)
     {
       lcm = i;
       break;
    }
  }
    printf("\nLCM of %d and %d = %d\n\n", n1, n2, lcm);
}
```

63. Write a program to find the HCF (highest common factor) of two numbers.

```
#include <stdio.h>
void main()
{
   int i, n1, n2, j, hcf=1;
   printf("\n\n HCF of two numbers:\n ");
   printf("------------\n");
   printf("Input 1st number for HCF: ");
   scanf("%d", &n1);
   printf("Input 2nd number for HCF: ");
   scanf("%d", &n2);
   j = (n1<n2) ? n1 : n2;
   for(i=1; i<=j; i++)
   {
      if(n1%i==0 && n2%i==0)
      {
          hcf = i;
   }
  }
printf("\nHCF of %d and %d is : %d\n\n", n1, n2, hcf);
}
```

64. Write a program to find the factorial of a given number using the while loop.

```
#include<stdio.h>
void main()
{
int n,f=1;
   printf("enter value of n");
   scanf("%d",&n);
```

```
    while(n>=1)
{
f=f*n;
n=n–1;
}
printf(“\nfactorial=%d”,f);
}
```

65. Write a program to find the factorial of a given number using the for loop.

```
#include<stdio.h>
void main()
{
int n,f=1,i;
    printf(“enter value of n”);
    scanf(“%d”,&n);
    for(i=1;i<=n;i++)
{
    f=f*i;
}
printf(“\nfactorial=%d”,f);
}
```

66. Write a program to input numbers until the user enters 99.

```
#include<stdio.h>
void main()
{
int n,f=1;
    printf(“enter value of n”);
    scanf(“%d”,&n);
    while(n!=99)
```

```
{
printf(“enter another number”);
   scanf(“%d”,&n);
}
printf(“\Thanks for using program..);
}
```

67. Write a program to convert a binary number into a decimal number using the math function.

```
#include <stdio.h> #include <math.h>
void main()
{int n1, n;
   int dec=0,i=0,j,d;
   printf(“Input the binary number :”);
   scanf(“%d”,&n);
   n1=n;
   while(n!=0)
   {
d = n % 10;
   dec=dec+d*pow(2,i);
   n=n/10;
   i++;
  }
printf(“\nThe Binary Number : %d\nThe equivalent
Decimal Number is : %d\n\n”,n1,dec);
}
```

68. Write a program in C to find the sum of GP series.

```
#include <stdio.h>
#include <math.h>
void main()
```

```
{
   float g1,cr,i,n,j;
   float ntrm,gpn;
   float sum=0;
   printf("Input the first number of the G.P. series: ");
   scanf("%f",&g1);
   printf("Input the number or terms in the G.P. series: ");
   scanf("%f",&ntrm);
   printf("Input the common ratio of G.P. series: ");
   scanf("%f",&cr);
   printf("\nThe numbers for the G.P. series:\n ");
      printf("%f ",g1);
      sum=g1;
   for(j=1;j<ntrm;j++)
   {
   gpn=g1*pow(cr,j);
   sum=sum+gpn;
   printf("%f ",gpn);
}
printf("\nThe Sum of the G.P. series : %f\n\n",sum);
}
```

69. Write a program to input the four-digit ATM pin. (pin should not be visible).

```
#include<stdio.h>
void main()
{
char pin; int i;
   for(i=1;i<=4;i++)
   {
```

```
    pin=getch();
    printf("*");
  }
  printf("\nThanks for Entering");
  }
```

70. Write a program to calculate X=NP.

```
  #include<stdio.h>
  void main()
  {
  int n,p,x=1;
  printf("enter number and power"); scanf("%d%d",&n,&p);
  while(p>=1)
  {
    x=x*n;
    p--;
  }
  printf("\ncalculation=%d",x);
  }
```

CHAPTER 6

Use of Goto

71. Write a menu-driven program for +, –, and * without using any loop.

```
#include<stdio.h>
#include<stdlib.h>
void main()
{
int num1,num2,ans,choice; start:{
printf("\nenter choice:\npress 1 for addition\npress 2 for subtract\ npress 3 for multliplication\npress any other for exit\n");
scanf("%d",&choice);
if(choice==1)
goto addi;
else if(choice==2)
goto subt;
else if(choice==3)
goto multi;
else
   goto stop;
}
addi:{
printf("\nenter 2 numbers");
scanf("%d%d",&num1,&num2); ans=num1+num2;
printf("\naddition of %d and %d is %d",num1,num2,ans);
goto start;
}
```

```
subt:{
printf("\nenter 2 numbers");
scanf("%d%d",&num1,&num2);
ans=num1–num2;
printf("\nsubtraction of %d and %d is %d",num1,num2,ans);
goto start;
}
multi:{
printf("\nenter 2 numbers");
scanf("%d%d",&num1,&num2);
ans=num1*num2;
printf("\nmultiplication of %d and %d is %d",num1,num2,ans);
goto start;
}
stop:{
   exit(0);
}
}
```

72. Write a program to print the Fibonacci series 0,1,1,2,3,5,8...N.

```
#include<stdio.h>
void main()
{
int i=0,j=1,n;
   printf("enter value of n");
   scanf("%d",&n);
   while(i<=n)
   {
   printf("\n%d",i);
   j=i+j;
```

```
i=j–i;
}
}
```

73. Write a program to print a number in the reverse order.

Example: Input N=123; output 321

```
 #include<stdio.h>
void main()
{
int num,rev=0,remainder;
   printf(“enter number”);
   scanf(“%d”,&num);
   while(num!=0)
   {
   remainder=num%10;
   rev=rev*10+remainder;
num=num/10;
}
printf(“\nreverse number=%d”,rev);
 }
```

74. Write a program to check whether a given number is palindrome or not.

```
#include<stdio.h>
void main()
{
int num,rev=0,remainder,X;
   printf(“enter number”);
   scanf(“%d”,&num);
       X=num;
   while(num!=0)
   {
```

```
    remainder=num%10;
    rev=rev*10+remainder;
num=num/10;
}
if(rev==X)
printf("\nNumber is palindrome");
else
printf("\nNot Palindrome");
  }
```

75. Write a program to check whether a given number is Armstrong or not.
Example: N=153 ; (1*1*1) + (5*5*5) + (3*3*3)=153

```
#include<stdio.h>
void main()
{
int num,rev=0,remainder,X;
    printf("enter number");
    scanf("%d",&num);
        X=num;
    while(num!=0)
    {
    remainder=num%10;
    rev=rev+(remainder * remainder * remainder);
num=num/10;
}
If(rev==X)
printf("\nNumber is Armstrong");
else
printf("\nNot Armstrong");
  }
```

76. Write a program to print the sum of each digit of given number.

```
#include<stdio.h>
void main()
{
int num,rev=0,remainder,sum=0;
   printf("enter number");
   scanf("%d",&num);
   while(num!=0)
   {
   remainder=num%10;
   sum=sum+remainder
num=num/10;
}
printf("\nSum of each digits is %d",sum);
  }
```

77. Write a program to print the table of each digit of given number.

```
#include<stdio.h>
void main()
{
int num,rev=0,remainder,i;
   printf("enter number");
   scanf("%d",&num);

   while(num!=0)
   {
   remainder=num%10;
       for(i=1;i<=10;i++)
       {
        printf("%d * %d=
```

```
%d",remainder,i,remainder*i);
        }
   num=num/10;
   printf("\n\n");
}
 }
```

78. Write a program to check whether two given numbers are amicable are not.

Hint: Proper divisior of the first number = second number, and proper divisor of the second number= first number.

```
#include<stdio.h>
void main()
{
int num1,num2,i,r,sum1=0,sum2=0
printf("enter num1");
scanf("\n%d",&num1);
printf("enter num2");
scanf("\n%d",&num2);
   for(i=1;i<=num1/2;i++)
       {
        if(num1%i==0)

        sum1=sum1+i;
       }
        for(i=1;i<=num2/2;i++)
       {
        if(num2%i==0)
        sum2=sum2+i;
 }
```

```
    if(num1==sum2 && num2==sum1)
printf("\nnumber is amicable");
    else
printf("\nnot a amicable number");*/
}
```

79. Find the factorial of given number using the do-while loop.

```
#include<stdio.h>
void main()
{
int f=1,n;
    printf("enter number");
    scanf("%d",&n);

    do{ f=f*n;
    n--;
    }
    while(n>=1);

    printf("\nfactorial=%d",f);
}
```

80. Write a program to display the *n* terms of harmonic series and their sum. The series is : 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n

```
#include <stdio.h>
void main()
{
    int i,n;
    float s=0.0;
    printf("Input the number of terms : ");
    scanf("%d",&n);
```

```
    printf("\n\n");
    for(i=1;i<=n;i++)
    {
        if(i<n)
        {
    printf("1/%d + ",i);
    s+=1/(float)i;
        }
    if(i==n)
    {
    printf("1/%d ",i);
    s+=1/(float)i;
  }
  }
        printf("\nSum of Series upto %d terms : %f \n",n,s);
}
```

81. Write a program to check whether a given number is a perfect number or not.

```
#include <stdio.h>
void main()
{
    int n,i,sum; int mn,mx;
    printf("Input the number : ");
    scanf("%d",&n);
        sum = 0;
    printf("The positive divisor : ");
        for (i=1;i<n;i++)
        {
        if(n%i==0)
```

```
        {
        sum=sum+i;
        printf("%d ",i);
    }
  }
printf("\nThe sum of the divisor is : %d",sum);
    if(sum==n)
    printf("\nSo, the number is perfect.");
else
    printf("\nSo, the number is not perfect.");
printf("\n");
}
```

82. Write a program to determine whether a given number is prime or not.

```
#include <stdio.h>
void main(){
    int num,i,temp=0;
    printf("Input a number: ");
    scanf("%d",&num);
    for(i=2;i<=num/2;i++){
        if(num % i==0){
    temp=1;
          break;
    }
  }
    if(temp==0)
        printf("%d is a prime number.\n",num);
    else
        printf("%d is not a prime number",num);
}
```

83. Write a program to convert a decimal number into binary.

```
#include <stdio.h>
void main()
    {
    int n, i, j, binno=0,decimal_num;
    printf("Enter a number to convert : ");
    scanf("%d",&n);
    decimal_num =n;
    i=1;
    for(j=n;j>0;j=j/2)
        {
        binno=binno+(n%2)*i; i=i*10;
        n=n/2;
        }
    printf("\nThe Binary of %d is %d.\n\n", decimal_num,binno);
}
```

84. Write a program to implement all operations of an ATM.

```
#include <stdio.h>
#include <conio.h>
#include<stdlib.h>
int main()
    {
int a=5000,ch=1,d,i;
char pin;
    printf("\n please enter your 4 digit secret ATM pin:\n");
    for(i=1;i<=4;i++)
        {
    pin=getch();
    printf("*");
```

```
  if(pin!='0')
  {
        printf("Invalid Pin,Try again");
        return 0;
  }
}
  while(ch!=4)
  {
  printf("\n please enter your choice:\n");
  printf("1.enter 1 to check you balance \n");
  printf("2.enter 2 for deposit \n");
  printf("\n3.enter 3 for withdrawal\n");
  printf("\n4. enter 4 for exit.");
  scanf("%d",&ch);
  switch(ch)
  {
  case 1:
     printf("\n your balance is %d",a);
     break;
  case 2:
     printf("\n please enter amount to deposit");
     scanf("%d",&d);
     a=a+d;
     printf("\n after deposit your balance is %d",a);
     break;
  case 3:
     printf("\n please enter amount to withdrawal:");
      scanf("%d",&d);
      if(d%100==0)
```

```
        {
        if(d<=a)
        {
        a=a–d;
        printf("\n after withdrawal your amount
        is%d:",a);
        }
        else{ printf("\n u have not suffcient amount in your account");
        }
        }
        else
        {
        printf("\n please enter amount of multiple of 100");
        getch();
        }
        break;
    case 4:
        printf("\n thanks for using your ATM, visit us again");
  }
  }
return 1;
}
```

85. Write a program to find the smallest of the three numbers.

```
#include<stdio.h>
int main()
{
   int a,b,c;
        printf("enter 3 no");
        scanf("%d%d%d",&a,&b,&c);
```

```
        if(a<b)
         {
         if(a<c)
         {
         printf("%d is smaller",a);
         }
         else
           {
           printf("%d is smaller",c);
           }
         }
         else if(b<c)
         {
         printf("%d is smaller",b);
         }
         else
         {
         printf("%d is smaller",c);
    }
}
```

CHAPTER 7

Goto

A goto statement in C programming provides an unconditional jump from the *goto* to a labeled statement in the same function.

The goto statement transfers control to a label. The given label must reside in the same function and can appear before only one statement in the same function.

The syntax of a goto statement is: goto label_name;

Here, label_name should be a valid identifier name, and : (colon) should be used after label_name.

86. Write a program to check login; a user can try for three times only.

```
#include<stdio.h>
#include<conio.h>
int main()
{
   char user_name='a',password='z',i=0;
   start:
       {
       printf("\nenter user_name");
       scanf("%c",&user_name);
       printf("\n\nenter password");
       password=getch();
       fflush(stdin);
       if(user_name!='a'||password!='z')
         {
         printf("\naccess denied\n");
```

```
        goto incr;
        }
      if(user_name==’a’ && password==’z’)
        {
      printf(“\nwelcome sir”);
        }
        goto end;
        }
   incr:
      { i++;
      if(i<3)
        {
        goto start;
        }
        goto lock;
      }
      lock:
      {
        printf(“\naccount is locked”);
        goto end;
      }
  end: getch();
}
```

CHAPTER 8

Patterns

Pattern programs print various patterns of numbers and stars. These codes illustrate how to create various patterns using C programming.

Most of these C programs involve usage of nested for loops.

A pattern of numbers, stars, or characters is a way of arranging these in some logical manner, or they may form a sequence.

```
    for( ) // outer loop for rows
{
for( ) // inner loop for columns
{ }
}
```

The condition in the inner loop depends on the number of columns in a row.

87. Display the following pattern (26 pattern):

```
    1)
    *
    **
    ***
    ****
    ******
    #include<stdio.h>
    void main()
    {
    int i,j;
```

```
    for (i=1;i<=5;i++)
    {
      for(j=1;j<=i;j++)
      {
      printf(“*”);
      }
      printf(“\n”);
    }
}
```

2)

```
1
21
321
4321
54321
#include<stdio.h>
void main()
{
    for(i=1;i<=5;i++)
    {
        for(j=i;j>=1;j--)
        {
        printf(“%d”,j);
        }
        printf(“\n”);
  }
}
```

3)

```
54321
4321
321
21
1
#include<stdio.h>
void main()
{
   int i,j;
       for(i=5;i>=1;i--)
       {
         for(j=i;j>=1;j--)
         {
         printf("%d",j);
         }
         printf("\n");
   }
}
```

4)

```
54321
5432
543
54
5
#include<stdio.h>
void main()
{
```

```
   int i,j;
       for(i=1;i<=5;i++)
         {
          for(j=5;j>=i;j--)
          {
           printf("%d",j);
          }
           printf("\n");
    }
 }
```

5)

12345

1234

123

12

1

```
#include<stdio.h>
void main()
{
   int i,j;
       for(i=5;i>=1;i--)
       {
        for(j=1;j<=i;j++)
        {
        printf("%d",j);
        }
        printf("\n");
   }
```

```
}
```

6)

```
*
*#
*#*
*#*#
*#*#*
#include<stdio.h>
void main()
{
   int i,j;
       for(i=1;i<=5;i++)
       {
        for(j=1;j<=i;j++)
        {
        if(j%2==0)
        printf("#");
        else
        printf("*");
        }
        printf("\n");
   }
}
```

7)

```
5
54
543
```

5432
54321

```
#include<stdio.h>
void main()
{
   int i,j;
       for(i=5;i>=1;i--)
         {
          for(j=1;j<i;j++)
          {
           printf(“ “);
          }
           for(j=5;j>=i;j--)
          {
           printf(“%d”,j);
    }
}
```

8)
12345
2345
345
45
5

```
}
#include<stdio.h>
void main()
{
   printf(“\n”);
```

```
    int i,j;
    for(i=1;i<=5;i++)
    {
    for(j=1;j<i;j++)
    {
        printf(" ");
  }
    for(j=i;j<=5;j++)
    {
         printf("%d",j);
    }
    printf("\n");
  }
}
```

9)

```
*
**
***
****
*****
#include<stdio.h>
void main()
{
    int i,j;
    for(i=1;i<=5;i++)
    {
      for(j=i;j<5;j++)
      {
```

```
      printf(“ “);
      }
    for(j=1;j<=i;j++)
      {
      printf(“*”);
      }
          printf(“\n”);
  }
}
```

10)

```
******
****
***
**
*
#include<stdio.h>
void main()
{
   int i,j;
        for (i=5;i>=1;i--)
        {
          for(j=5;j>i;j--)
            {
            printf(“ “);
            }
          for(j=1;j<=i;j++)
            {
            printf(“*”);
```

```
            }
            printf("\n");
    }
}
```

11)

A
BA
CBA
DCBA
EDCBA

```
#include<stdio.h>
void main()
{
    int i,j;
    for(i=65;i<=69;i++)
    {
      for(j=i;j<69;j++)
            {
            printf(" ");
            }
          for(j=i;j>=65;j--)
            {
            printf("%c",j);
            }
            printf("\n");
    }
```

12)

A
AB
ABC
ABCD
ABCDE

```
#include<stdio.h>
void main()
{
   int i,j;
for (i=65;i<=69;i++)
   {
     for(j=i;j<69;j++)
       {
       printf(" ");
       }
     for(j=65;j<=i;j++)
       {
       printf("%c",j);
       }
       printf("\n");
   }
}
```

13)

A
ABA
ABCBA
ABCDCBA
ABCDEDCBA

```
#include<stdio.h>
void main()
{
int i,j,k;
    for(i=65;i<=69;i++)
    {
      for(j=i;j<69;j++)
      {
        printf(" ");
      }
      for(j=65;j<=i;j++)
      {
      printf("%c",j);
      }
      for(k=j–2;k>=65;k--)
        {
        printf("%c",k);
        }
        printf("\n");
    }
}
```

14)

```
*
* *
* * *
* * * *
* * * * *
#include<stdio.h>
```

```
void main()
{
int i,j,k;
    for(i=1;i<=5;i++)
    {
     for(j=i;j<5;j++)
     {
     printf(“ “);
     }
     for(j=1;j<=i;j++)
     {
      if(j%2==0)
      printf(“ “);
      else
      printf(“*”);
     }
     for(k=j–2;k>=1;k--)
      {
      if(k%2==0)
      printf(“ “);
      else
      printf(“*”);
      }
      printf(“\n”);
  }
}
```

15)

****

****
*****
***
*

```
#include<stdio.h>
void main()
{
int i,j,k;
    for(i=1;i<=5;i++)
    {
    for(j=1;j<i;j++)
    printf(“ “);
    for(j=i;j<=5;j++)
    printf(“*”);
    for(k=i;k<5;k++)
    printf(“*”);
printf(“\n”);
  }
}
```

16)

- - - -*
- - - *- *
- - *- - - *
-* - - - - -*
****

```
#include <stdio.h>
int main()
{
```

```
    int i, j, rows=5;
    for(i=1; i<=rows; i++)
    {
        /* Print trailing spaces */
        for(j=i; j<rows; j++)
        {
          printf(" ");
        }
        for(j=1;
        j<=(2*i-1); j++)
        {
        if(i==rows || j==1 || j==(2*i-1))
        {
          printf("*");
          }
          else
          {
            printf(" ");
          }
        }
        /* Move to next line */
        printf("\n");
  }
    return 0;
}
```

17)

```
*
* *
```

```
* * *
* * * *
* * * * *
* * * *
* * *
* *
*
#include<stdio.h>
int main()
{
   int i, j, rows=5, columns;
   columns=1;

   for(i=1;i<rows*2;i++)
   {
      for(j=1; j<=columns; j++)
      {
        printf("*");
      }
      if(i < rows)
      {
        columns++;
      }
      else
      {
        columns--;
    }
      printf("\n");
     }
```

```
        return 0;
}
```

18)

```
* * * * * * * * * *
* * * *   * * * *
* * *       * * *
* *           * *
*               *
*               *
* *           * *
* * *       * * *
* * * *   * * * *
* * * * * * * * * *
```

```
#include <stdio.h>
int main()
{
   int i, j, n=5;
   for(i=1; i<=n; i++)
   {
   for(j=i; j<=n; j++)
   {
     printf("*");
   }
   for(j=1; j<=(2*i-2); j++)
   {
     printf(" ");
   }
   for(j=i; j<=n; j++)
```

```
    {
      printf("*");
    }
    printf("\n");
  }
      for(i=1; i<=n; i++)
    {
    for(j=1; j<=i; j++)
    {
    printf("*");
  }
    for(j=(2*i-2); j<(2*n-2); j++)
    {
    printf(" ");
  }
    for(j=1; j<=i; j++)
    {
    printf("*");
  }
    printf("\n");
  }

    return 0;

}
```

19)

```
*                 *
  *             *
    *         *
```

```
        *
        *
    *       *
  *           *
*               *
```

```
#include <stdio.h>

int main()
{
   int i, j, N=5;
   int count;

   count = N * 2 - 1;
   for(i=1; i<=count; i++)
   {
      for(j=1; j<=count; j++)
      {
        if(j==i || (j==count - i + 1))
        {
          printf("*");
        }
        else
        {
          printf(" ");
        }
      }
      printf("\n");
    }
      return 0;
```

}

20)

```
      **********
   **************
 ******************
********************
 ******************
  ****************
   **************
    ************
      *********
       *******
        *****
         ***
          *
```

```
#include <stdio.h>
int main()
{
   int i, j, n=10;
       for(i=n/2; i<=n; i+=2)
       {
       for(j=1; j<n-i; j+=2)
       {
         printf(“ “);
       }
       for(j=1; j<=i; j++)
       {
         printf(“*”);
```

```
        }
        for(j=1; j<=n-i; j++)
        {
          printf(" ");
        }
        for(j=1; j<=i; j++)
        {
          printf("*");
        }
          printf("\n");
        }
        for(i=n; i>=1; i--)
        {
        for(j=i; j<n; j++)
        {
          printf(" ");
          }
        for(j=1; j<=(i*2)-1; j++)
        {
          printf("*");
        }
        printf("\n");
      }
        return 0;
}
```

21)

```
   * * * *
  *     *
```

```
  *     *
 *     *
* * * *
#include <stdio.h>
int main()
{
   int i, j, rows=5;

   for(i=1; i<=rows; i++)
   {
      /* Print trailing spaces */
      for(j=1; j<=rows-i; j++)
      {
        printf(" ");
      }
      /* Print stars and center spaces */
      for(j=1; j<=rows; j++)
      {
      if(i==1 || i==rows || j==1 || j==rows)
        printf("*");
      else
        printf(" ");
      }
      printf("\n");
    }

      return 0;
}
```

22.

```
56789
 4567
  345
   23
    1
#include <stdio.h>
int main()
{
    int i, j, k, N=5;

    for(i=N; i>=1; i--)
    {
        k = i;
        for(j=1; j<=i; j++, k++)
        {
          printf(“%d”, k);
        }
          printf(“\n”);
        }
        return 0;
}
```

23)

```
1              1
12           21
123        321
1234    4321
1234554321
```

```
#include <stdio.h>
int main()
{
   int i, j, N=5;
       for(i=1; i<=N; i++)
    {
       // Prints first part of pattern
       for(j=1; j<=i; j++)
       {
         printf("%d", j);
       }
       // Prints spaces between two parts
       for(j=i*2; j<N*2; j++)
       {
         printf(" ");
       }
       // Prints second part of the pattern
       for(j=i; j>=1; j--)
       {
         printf("%d", j);
       }
         printf("\n");
       }
    return 0;}
```

24)

```
1         1
 2       2
  3      3
```

```
  4      4
      5
      5
  4      4
 3        3
2         2
1         1
#include <stdio.h>

int main()
{
    int i, j, N=5;
 // First part of the pattern
   for(i=1; i<=N; i++)
   {
 // Print trailing spaces
   for(j=1; j<i; j++)
   {
   printf(" ");
 }
       printf("%d", i);

 // Print central spacces
   for(j=1; j<=((N - i) * 2 - 1); j++)
   {
      printf(" ");
 }
 // Don't print for last row if(i != N)
   printf("%d", i);
```

```
  // Moves on to the next row
    printf("\n");
  }
  // Second part of the pattern
    for(i=N-1; i>=1; i--)
    {
  // Print trailing spaces for(j=1; j<i; j++)
    {
        printf(" ");
  }
        printf("%d", i);
  // Print central spaces
    for(j=1; j<=((N - i ) * 2 - 1); j++)
    {
        printf(" ");
  }
        printf("%d", i);

  // Move on to the next line printf("\n");
  }
    return 0;
}
```

25)

```
01110
10001
10001
10001
```

01110

```
#include <stdio.h>
int main()
{
   int i, j, rows=5, cols=5;

   for(i=1; i<=rows; i++)
   {
       for(j=1; j<=cols; j++)
       {
        // Print corner element
        if((i==1 || i==rows) && (j==1 || j==cols))
        {
             printf(“0”);
        }
        else if(i==1 || i==rows || j==1 || j==cols)
        { // Print edge
             printf(“1”);
        }
        else
        {    // Print center
             printf(“0”);
        }
        }

             printf(“\n”);
        }
       return 0;
}
```

26)

```
1
11
101
1001
11111
#include <stdio.h>
int main()
{
   int i, j, N=5;
   for(i=1; i<=N; i++)
   {
       for(j=1; j<=i; j++)
       {
       if(i==1 || i==N || j==1 || j==i)
       {
            printf("1");
       }
       else
       {
            printf("0");
       }
       }
            printf("\n");
       }
  return 0;
}
```

88. Write a program to convert a decimal number into a binary number.

```
#include <stdio.h>
int main()
{
   long decimal, temp, binary;
   int rem, place = 1;
   binary = 0;
   printf("Enter any decimal number: ");
   scanf("%lld", &decimal);
   temp = decimal;
 /* Decimal to binary conversion */
   while(temp > 0)
   {
      rem = temp % 2;
      binary = (rem * place) + binary;
      temp /= 2;
      place *= 10;
 }
   printf("Decimal number = %ld\n", decimal);
   printf("Binary number = %ld", binary);
   return 0;
}
```

89. Write a program to count the number of times a digit occurs in a number.

```
#include <stdio.h>
int main()
{
   long num, n;
   int i, LDigit;
   int freq[10];
```

```
  printf(“Enter any number: “);
  scanf(“%ld”, &num);

 /* Initialize frequency array with 0 */
  for(i=0; i<10; i++)
  {
  freq[i] = 0;
 }

 /* Copy the value of ‘num’ to ‘n’ */
  n = num;



 /* Run till ‘n’ is not equal to zero */ while(n != 0)
  {
     /* Get last digit */
     LDigit = n % 10;
     n /= 10;

     /* Increment frequency array */ freq[LDigit]++;
 }
  printf(“Frequency of each digit in %ld is: \n”, num);
  for(i=0; i<10; i++)
  {
  printf(“Frequency of %d = %d\n”, i, freq[i]);
 }
  return 0;
}
```

90. Write a program to input 10 numbers in an array and print it in the reverse order.

```
#include <stdio.h>
void main()
{
   int i,n,a[10];
   printf("Input %d number of elements in the array :\n",n);
for(i=0;i<10;i++)
   {
      printf("element - %d : ",i);
      scanf("%d",&a[i]);
    }

   printf("\nThe values store into the array are : \n"); for(i=0;i<10;i++)
   {
      printf("% 5d",a[i]);
    }
   printf("\n\nThe values store into the array in reverse are :\n");
for(i=9;i>=0;i--)
   {
   printf("% 5d",a[i]);
   }
   printf("\n\n");
}
```

91. Write a program to print the sum of elements in an array.

```
#include<stdio.h>
#include<conio.h>
int main()
{
int a[5],i,sum=0;
```

```
  for(i=0;i<5;i++)
  {
  printf("enter %d number",i+1);
  scanf("%d",&a[i]);
 }
  for(i=0;i<5;i++)
  {
  printf("\na[%d]=%d",i,a[i]);
  sum=sum+a[i];
 }
  printf("\nsum of array=%d",sum);
  return1;
}
```

92. Write a program to check whether an element exists in an array or not (linear search)

```
#include<stdio.h>
#include<conio.h>
int main()
{
int a[5],i,sum=0,v,position=–1;
for(i=0;i<5;i++)
   {
      printf("enter %d number",i+1);
      scanf("%d",&a[i]);
 }
      printf("\nenter a number to search");
      scanf("%d",&v);

  for(i=0;i<5;i++)
```

```
    {
    if(v==a[i])
    {
    position=i+1; break;
    }
    }
    if(position==–1)
    {
    printf("\nvalue does not exist");
    }
    else
    printf("\n value exist at position%d",position);
    return 1;
}
```

93. Write a program to check whether two given numbers are Amicable or not?

```
#include<stdio.h>
int main()
{
int i;
int firstNumber,secondNumber;

int firstDivisorSum = 0;
int secondDivisorSum = 0;

printf("Enter two numbers to check if Amicable or not : ");
scanf("%d %d",&firstNumber,&secondNumber);

for(int i=1;i<firstNumber;i++){
```

```
    if(firstNumber % i == 0){
      firstDivisorSum = firstDivisorSum + i;
    }
  }

  for(int i=1;i<secondNumber;i++){
    if(secondNumber % i == 0){
      secondDivisorSum = secondDivisorSum + i;
    }
  }

  if((firstNumber == secondDivisorSum) && (secondNumber ==
firstDivisorSum)){
      printf("%d and %d are Amicable
numbers\n",firstNumber,secondNumber);
  }else{
      printf("%d and %d are not Amicable
numbers\n",firstNumber,secondNumber);
    }
  }
```

94. Write a program to check whether a given number is strong number or not?

```
#include<stdio.h>
int main()
{
    int i, originalNum, num, lastDigit, sum;
    long fact;
    printf("Enter any number to check Strong number: ");
    scanf("%d", &num);
```

```
    originalNum = num;
    sum = 0;

    /* Find sum of factorial of digits */
    while(num > 0)
    {
    lastDigit = num % 10;

      /* Find factorial of last digit */
      fact = 1;
      for(i=1; i<=lastDigit; i++)
      {
        fact = fact * i;
      }

      sum = sum + fact;

      num = num / 10;
}

/* Check Strong number condition */
if(sum == originalNum)
{
    printf("%d is STRONG NUMBER", originalNum);
}
else
  {
    printf("%d is NOT STRONG NUMBER", originalNum);
  }
```

```
return 0;
}
```

95. Write a program to print series 1,11,111,1111,11111…N

```
#include<stdio.h>
int main()
{
int i,x=1,N;
printf("\nEnter Limit N\n");
scanf("%d",&N);

printf("\n");
for(i=1;i<=N;i++)
{
printf("%d,",x);
x=(x*10)+1;
}
printf("\b ");
return(0);
}
```

96. Write a program to find first , second and third maximum out of 10 numbers ?

```
#include<stdio.h>
#include<limits.h>
# define max 6
int main()
{
int arr[max],i,first_max,second_max,third_max;
printf("%d",INT_MIN);
for(i=0;i<max;i++)
```

```
{
   printf("Enter array elements\n");
   scanf("%d",&arr[i]);
}

first_max=second_max=third_max=INT_MIN;
for(i=0;i<max;i++)
{
   if(arr[i]>first_max)
   {
      third_max=second_max;
      second_max=first_max;
      first_max=arr[i];
  }
   else if(arr[i]>second_max)
   {
      third_max=second_max;
      second_max=arr[i];
   }
   else if(arr[i]>third_max)
   {
      third_max=arr[i];
  }

}
printf("\n\nFirst maximum=%d",first_max);
printf("\nSecond maximum=%d",second_max);
printf("\nThird maximum=%d",third_max);
return(0);
```

```
}
```

97. Write a program to display current Date and time?

```
#include<stdio.h>
#include<time.h>
int main()
{
   printf("\n\tSwati Computers - Best place to learn\n\n\n");
   time_t t; // not a primitive datatype
   time(&t);
   printf("\nCurrent Date and time (date and time): %s", ctime(&t));
   return 0;
}
```

98. Write a program to check whether a given number is perfect square or not?

```
#include<stdio.h>
int main()
{
   printf("\n\n\tSwati Computers- Develope's Choice\n\n\n");
   // variable declaration
   int i, number;

   // take user input
   printf("Enter a number: ");
   scanf("%d", &number);
   // loop to check number is perfect square or not
   for(i = 0; i <= number; i++)
   {
      if(number == i*i)
      {
```

```
        printf("\n\n\n\t\t\t%d is a perfect square\n\n\n", number);
        printf("\n\n\t\t\tCoding is Fun !\n\n\n");
        return 0; // same as using break in this case to end the program
      }
    }
    printf("\n\n\n\t\t\t%d is not a perfect square\n", number);
     return 0;
}
```

CHAPTER 9

Using string.h

A string in the C language is simply an array of characters. Strings must have a NULL or \0 character after the last character to show where the string ends. A string can be declared as a character array or with a string pointer.

The C language provides no explicit support for strings in the language itself. The string-handling functions are implemented in libraries.

String I/O operations are implemented in <stdio.h> (puts, gets, etc.). A set of simple string manipulation functions is implemented in <string.h>, or on some systems in <strings.h>.

The string library (string.h or strings.h) has some useful functions for working with strings, such as strcpy, strcat, strcmp, strlen, and strcoll. We will take a look at some of these string operations.

String functions	Description
strcat ( )	Concatenates str2 at the end of str1
strncat ( )	Appends a portion of string to another
strcpy ( )	Copies str2 into str1
strncpy ( )	Copies the given number of characters of one string to another
strlen ( )	Gives the length of str1
strcmp ( )	Returns 0 if str1 is same as str2. Returns <0 if strl < str2. Returns >0 if str1 > str2
strcmpi ( )	Same as strcmp() function. But, this function negotiates case. “A” and “a” are treated as same.

strchr ( )	Returns pointer to the first occurrence of char in str1
strrchr ( )	Last occurrence of a given character in a string is found
strstr ( )	Returns pointer to the first occurrence of str2 in str1
strrstr ( )	Returns pointer to the last occurrence of str2 in str1
strdup ( )	Duplicates the string
strlwr ( )	Converts a string to lowercase
strupr ( )	Converts a string to uppercase
strrev ( )	Reverses the given string
strset ( )	Sets all character in a string to a given character
strnset ( )	It sets the portion of characters in a string to the given character
strtok ( )	Tokenizes the given string using a delimiter

99. Write a program to merge a title according to the gender in name using the string.h function.

```
void main(){
int i;
        char a[20],b[20];
        char gender;
        printf("enter your name");
        scanf("%s",&a);
        fflush(stdin);
        printf("enter your gender");
    scanf("%c",&gender);
         if(gender=='m'||gender=='M')
```

```
{
//printf("Mr. %s",a);
strcpy(b,"Mr.");
}
else
{
//printf("Ms. %s",a);
strcpy(b,"Ms.");
}
strcat(b,a);
printf("%s",b);
}
```

100. Write a program to enter a one-digit number and display it in words.

```
#include<stdio.h>
void main()
{
char n[][10]={{"Zero"},{"one"},{"two"},{"three"},{"four"},{"f
ive"},{"six"},{"seven"},{"eight"},{"nine"}};
int num;
printf("enter any 1 digit number \n"); scanf("%d",&num);
   printf("\nIn Words: %s",n[num]);
}
```

CHAPTER 10

Array– 1D and 2D

An array is a collection of similar data type values.

An array is defined as a finite-ordered collection of homogenous data, stored in continuous memory locations.

The syntax of an array is:

Datatype array_name[size]; // 1D array

Datatype array_name[No_of_Rows][No-Of_columns] // 2D array

An array index always starts with 0 to size–1.Both the row and column index starts with 0.

Advantages of arrays

1) Code optimization: Less code to access the data.
2) Easy to traverse data: By using the for loop, we can retrieve the elements of an array easily.
3) Easy to sort/search data: To sort the elements of an array, we just need a few lines of code.
4) Random access: We can access any element randomly using an array.

101. Write a program to copy the elements from one array into another.

```
#include <stdio.h>
void main()
{

   int arr1[10], arr2[10];
   int i, n;
```

```
  for(i=0;i<10;i++)
  {
       printf("element - %d : ",i);
       scanf("%d",&arr1[i]);
       }
  /* Copy elements of first array into second array.*/
  for(i=0; i<10; i++)
  {
     arr2[i] = arr1[i];
  }
  /* Prints the elements of first array */
  printf("\nThe elements stored in the first array are :\n");
  for(i=0; i<n; i++)
  {
     printf("% 5d", arr1[i]);
  }
  /* Prints the elements copied into the second array.*/
  printf("\n\nThe elements copied into the second array are :\n");
for(i=0; i<n; i++)
  {
     printf("% 5d", arr2[i]);
  }
       printf("\n\n");
}
```

102. Write a program to find the maximum, second maximum, sum of even, and sum of odd elements of an array.

```
#include<stdio.h>
void main()
{
int a[5],i,max,smax=0,ev=0,od=0;
```

```
for(i=0;i<5;i++)
{
printf("Enter no\n");
scanf("%d",&a[i]);
}
max=a[0]; smax=a[0];

for(i=1;i<5;i++)
{
if(a[i]>max)
max=a[i];
else if(a[i]>smax )
smax=a[i];

if(a[i]%2==0) ev=ev+a[i]; else
od=od+a[i];

}
printf("\nMaximum=%d\nsecond maximum=%d\nsum of
even=%d\nsum of odd=%d",max,smax,ev,od);
}
```

103. Write a program to enter the first alphabet of your name and print a pattern.

Hint: Input: A

```
A
AB
ABC
ABCD
ABCDE
#include<stdio.h>
```

```
void main()
{
int i,j;
char c;
  printf(“Enter 1st letter of your name”);
  scanf(“%c”,&c);
for(i=c;i<=c+5;i++)
{
for(j=c;j<=i;j++)
{
  printf(“%c”,j);
}
printf(“\n”);
}
}
```

104. Write a program to convert a decimal into binary or octal number.

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
   int n,r,a[8],i=0,j,x;
   printf(“\nenter any decimal number”);
   scanf(“%d”,&n);
   printf(“\npress 2 for binary & 8 for octal”);
   scanf(“%d”,&x);
   while(n>=x)
   {
      r=n%x;
```

```
        a[i++]=r;
        n=n/x;
    }
     if(n>0)
     a[i++]=n;
     for(j=i–1;j>=0;j--)
     printf(“%d”,a[j]);
}
```

105. Write a program to convert a binary/octal number into a decimal number.

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
int n,r,x,y=0,i=0,z;
    printf(“press 2 for binary and press 8 for octal”);
    scanf(“%d”,&z);
    printf(“enter binary/octal num”);
    scanf(“%d”,&n); while(n!=0)
    {
        r=n%10;
        x=r*pow(z,i++);
        y=y+x; n=n/10;
    }
        printf(“decimal number is=%d”,y);
}
```

106. Write a program to sort an array in ascending order (linear sorting).

```
#include<stdio.h>
```

```
int main()
{
int a[5],i=0,j,temp;
   for(i=0;i<5;i++)
   {
   printf("Enter value\n");
   scanf("%d",&a[i]);
   }
for(i=0;i<5;i++)
   {
   for(j=i+1;j<5;j++)
   {
   if(a[i]>a[j])
   {
   temp=a[i]; a[i]=a[j]; a[j]=temp;
   }
   }
   }
   printf("\nSorted array:\n");
   for(i=0;i<5;i++)
   {
   printf("\n%d",a[i]);
   }
}
```

107. Write a program to sort an array using bubble sort.

```
#include<stdio.h> int main()
{
int a[5],i=0,j,temp;
   printf("\n\n--Bubble Sorting \n\n");
```

```
    for(i=0;i<5;i++)
    {
    printf("Enter value\n");
    scanf("%d",&a[i]);
    }
    for(i=0;i<5;i++)
    {
    for(j=0;j<5–i–1;j++)
    {
    if(a[j]>a[j+1])
    {
    temp=a[j];
    a[j]=a[j+1];
    a[j+1]=temp;
    }
    }
    }
    printf("\nSorted array:\n");
    for(i=0;i<5;i++)
    {
    printf("\n%d",a[i]);
    }
}
```

108. Write a program to search a value in an array using binary search.

```
#include<stdio.h>
int main()
{
int a[5],i=0,j,temp,first=0,last=4,mid,v,pos=–1;
    for(i=0;i<5;i++)
```

```
    {
    printf("Enter value\n");
    scanf("%d",&a[i]);
    }
  printf("\nEntre value to search");
    scanf("%d",&v);
    while(first<last)
    {
    mid=(first+last)/2;
    if(a[mid]==v)
    {
    pos=mid+1; break;
    }
    if(a[mid]>v)
    {
    last=mid–1;
    }
    if(a[mid]<v)
    {
    first=mid+1;
    }
    }
    if(pos==–1)
    printf("\nval not found ");
    else
    printf("\nval found at position %d",pos);
  }
```

109. Write a program to enter your name and display a pattern.

Hint: Hello H

He Hel Hell Hello

```
#include<stdio.h>
int main()
{
   int i,j; char a[20];

printf("enter your name");
scanf("%s",a);
for(i=0;a[i]!=NULL;i++)
{
   for(j=0;j<=i;j++)
   {
   printf("%c",a[j]);
   }
   printf("\n");
}
}
```

110. Write a program to count the vowels in a given name.

```
#include<stdio.h>
int main()
{
char a[20];
int i,count=0;
   printf("enter your name");
   gets(a);
   for(i=0;a[i]!=NULL;i++)
   {
      if(a[i]=='a'||a[i]=='e'||a[i]=='i'||a[i]=='o'||a[i]=='u')
        {
```

```
        count++;
        }
  }
        printf("number of vowel are %d",count);
}
```

111. Write a program to enter a string and replace *a* with *e*.

```
#include<stdio.h>
int main()
{
   int i;
   char a[20];
   printf("enter your name");
   gets(a);

   for(i=0;a[i]!=NULL;i++)
   {
   if(a[i]=='a')
   a[i]='e';
   if(a[i]=='A')
   a[i]='E';
}
printf("\n%s",a);
  }
```

105. Write a program to convert a capital letter into small and vice-versa in a given string.

```
#include<stdio.h>
void main()
{
char n[20];
```

```
int i;
printf(“Entre name”);
gets(n);
printf(“\nHello %s\n”,n);
printf(“\n\n%s”,n);
for(i=0;n[i]!=’\0’;i++)
{
   if(n[i]>=65 && n[i]<=90)
   n[i]+=32;
   else if(n[i]>=97 && n[i]<=122)
   n[i]–=32;
}
printf(“\n\n\n%s”,n);
}
```

106. Write a program to print the initials(abbreviation) of a given name.

```
#include<stdio.h>
#include<conio.h>
int main()
{
   int i;
   char n[50];
      printf(“enter your name”);
      gets(n);
      printf(“\n\n”);
printf(“%c.”,n[0]);
   for(i=1;n[i]!=NULL;i++)
   {
   if(n[i]==’ ‘) printf(“%c.”,n[i+1]);
   }
```

```
return 1;
}
```

107. Write a program to calculate the space and print the length of a name, excluding spaces.

```
#include<stdio.h>
#include<conio.h>
int main()
{
   int i,count=0;
   char n[50];
      printf("enter your name");
      //scanf("%s",n);
      gets(n);
      printf("\n\n");
      for(i=0;n[i]!=NULL;i++)
      {
       if(n[i]==' ')
       count++;
      }
      printf("\n");

   printf("\nSpace in name are %d",count); printf("\n\n");
   printf("\nLength of name exclding spaces is %d"i–
count);
return 1;
}
```

108. Write a program to convert an upper-case letter into lower-case and vice-versa in a given name.

```
#include<stdio.h>
```

```
#include<conio.h>
int main()
{
   int i,count=0;
   char n[50];
      printf("enter your name");
      //scanf("%s",n);
      gets(n);
      printf("\n\n");
      for(i=0;n[i]!=NULL;i++)
      {
      if(n[i]>=65 && n[i]<=90)
      n[i]+=32;
      else if(n[i]>=97 && n[i]<=122) n[i]=n[i]–32;
      }
      puts(n);
        return 1;
}
```

109. Write a program to print a name in the reverse order.

```
#include<conio.h>
int main()
{
   int i,j;
   char n[50];

      printf("enter your name");
      //scanf("%s",n);
      gets(n); printf("\n\n");
      for(i=0;n[i]!=NULL;i++);
```

```
        //length of name

        for(j=i–1;j>=0;j--)
        {
        printf(“%c”,n[j]);
       }
        printf(“\n”);

    return 1;
}
```

110. Write a program to check whether a given name is palindrome or not.

Hint: original string = reverse string

```
#include<stdio.h>
#include<conio.h>
#include<string.h>
int main()
{
char a[10],b[10];
int x;
    printf(“Enter name”);
    scanf(“%s”,a);
strcpy(b,a);
    printf(“\ncopy of a into b %s”,b);
    strrev(a);
printf(“\nReverse a %s”,a);
    if(x==0)
    printf(“\nPalindrome string”);
    else
    printf(“\nNot palindrome”);
```

```
return 1;
}
```

111. Using the string function using string.h

```
#include<conio.h>
#include<string.h>
int main()
{
char a[10],b[10],c[10]={“Hello “};
int i,len,x;
   printf(“Enter name”);
   scanf(“%s”,a);
   len=strlen(a);
   printf(“\nLength of name is %d”,len);
   strcpy(b,a);
   printf(“\ncopy of a into b %s”,b);
   strupr(b);
   printf(“\nCapitalize b %s”,b);
   strlwr(b);
   printf(“\nIn Small letters b= %s”,b);
   strrev(a);

   printf(“\nReverse a %s”,a);
   x=strcmp(a,b);
        if(x==0)
        printf(“\nPalindrome string”);
        else
        printf(“\nNot palindrome”);
   strcat(c,b);
```

```
    printf("\nConcatenate c %s",c);
  return 1;
}
```

112. Write a program to find the roll number of a student out of 10 students, scoring the highest marks.

```
#include<stdio.h>
int main()
{
   int a[10][2],i,j,rn,max=0;
   for(i=0;i<10;i++)
   {
        printf("enter roll no. and marks");
        for(j=0;j<2;j++)
        {
             scanf("%d",&a[i][j]);
          }
      }
      printf("\nroll no\t marks\n");
      for(i=0;i<10;i++)
        {
          for(j=0;j<2;j++)
        {
        printf("%d\t",a[i][j]);
        }
      printf("\n");
      }
   for(i=0;i<10;i++)
   {
      if(a[i][1]>max)
```

```
        {
        max=a[i][1];
        rn=a[i][0];
        }
       }
  }
printf("\nroll no %d scored highest marks %d",rn,max);
}
```

113. Write a program to input a 3×3 matrix and print the sum of rows.

```
#include<stdio.h>
int main()
{
int a[3][3],i,j,sum_row;
   for(i=0;i<3;i++)
   {
   printf("\nenter 3 nos");
   for(j=0;j<3;j++)
   {
   scanf("%d",&a[i][j]);
   }
   }
   for(i=0;i<3;i++)
   {
   printf("\n");
   sum_row=0;

   for(j=0;j<3;j++)
   {
   printf("%d\t",a[i][j]);
```

```
    sum_row= sum_row+a[i][j];
    }
printf("=%d", sum_row);
}
getch();
  }
```

114. Write a program to input a 3×3 matrix and print the transpose matrix.

```
#include<stdio.h>
int main()
{
int a[3][3],i,j;
    for(i=0;i<3;i++)
    {
    printf("\nenter 3 nos");
    for(j=0;j<3;j++)
    {
    scanf("%d",&a[i][j]);
}
}
for(i=0;i<3;i++)
    {
    printf("\n");
    for(j=0;j<3;j++)
    {
    printf("%d\t",a[j][i]);
}
}
}
```

115. Write a program to input a 3×3 matrix and print the diagonal of the matrix.

```
#include<stdio.h>
int main()
{
int a[3][3],i,j;
   for(i=0;i<3;i++)
   {
   printf("\nenter 3 nos");
   for(j=0;j<3;j++)
   {
   scanf("%d",&a[i][j]);
}
}
for(i=0;i<3;i++)
   {
   printf("\n");
   printf("%d\t",a[i][i]);
}
}
```

116. Write a program to input two 3×3 matrices and print their multiplication.

```
#include<stdio.h>
int main() {
   int a[3][3], b[3][3], c[3][3], i, j, k;
   int sum = 0;
   printf("\nEnter First Matrix : n");
   for (i = 0;
   i < 3; i++) {
   for (j = 0; j < 3;
```

```
j++) { scanf("%d", &a[i][j]);
    }
}
printf("\nEnter Second Matrix:n");
for (i = 0; i < 3; i++) {
for (j = 0; j < 3; j++) { scanf("%d", &b[i][j]);
}
}

printf("The First Matrix is: \n");
for (i = 0; i < 3; i++) {
for (j = 0; j < 3; j++) { printf(" %d ", a[i][j]);
}
printf("\n");
}
printf("The Second Matrix is : \n");
for (i = 0; i < 3; i++) {
for (j = 0; j < 3; j++) { printf(" %d ", b[i][j]);
}
printf("\n");
}
//Multiplication Logic
for (i = 0; i <= 2; i++) {
for (j = 0; j <= 2; j++) {
sum = 0;
for (k = 0; k <= 2; k++) {
sum = sum + a[i][k] * b[k][j];
}
c[i][j] = sum;
```

```
    }
    }
    printf("\nMultiplication Of Two Matrices : \n");
    for (i = 0; i < 3; i++) {
    for (j = 0; j < 3; j++) { printf(" %d ", c[i][j]);
    }
    printf("\n");
    }
    return (0);
}
```

117. Write a program to input two 3×3 matrices and print the addition of both matrices.

```
#include<stdio.h>
int main()
{
    int arr1[3][3], arr2[3][3], arr3[3][3];
    int i, j;
    printf("Enter First 3*3 Matrix Elements:\n");
    for(i = 0; i < 3; i++)
    {
        for(j = 0; j < 3; j++)
        {
          scanf("%d", &arr1[i][j]);
        }
    }
    printf("\nEnter Second 3*3 Matrix Elements:\n");
    for(i = 0; i < 3; i++)
    {
    for(j = 0; j < 3; j++)
```

```
        {
          scanf("%d", &arr2[i][j]);
        }
      }
      printf("\nAddition of Matrices:\n");
      for(i = 0; i < 3; i++)
      {
        for(j = 0; j < 3; j++)
        {
       arr3[i][j] = arr1[i][j] + arr2[i][j];
        }
      }
      printf("\nThird Matrix Elements:\n");
      for(i = 0; i < 3; i++)
      {
        for(j = 0; j < 3; j++)
        {
          printf("%d\t", arr3[i][j]);
        }
        printf("\n");
      }
      printf("\n");
      return 0;
    }
```

118. Write a program in C to accept a matrix and determine whether it is a sparse matrix.

```
#include <stdio.h>
/*A sparse martix is matrix which has more zero elements than nonzero elements */
void main ()
```

```
{
   static int arr1[10][10];
   int i,j,r,c;
   int ctr=0;
printf(“Input the number of rows of the matrix : “);
scanf(“%d”, &r);
printf(“Input the number of columns of the matrix : “);
scanf(“%d”, &c);
   printf(“Input elements in the first matrix :\n”);
for(i=0;i<r;i++)
{
   for(j=0;j<c;j++)
   {
      printf(“element - [%d],[%d] : “,i,j);
      scanf(“%d”,&arr1[i][j]);
      if (arr1[i][j]==0)
      {
      ++ctr;
      }
  }
}
   if (ctr>((r*c)/2))
   {
   printf (“The given matrix is sparse matrix. \n”);
   }
   else
   printf (“The given matrix is not a sparse matrix.\n”);
   printf (“There are %d number of zeros in the matrix.\n\n”,ctr);}
```

119. Write a pogram to find whether a given number exists in an array or not (binary search).

```
#inilude <stdio.h>
int main()
{
   int i, first, last, middle,search, array[10],pos=–1;
   for (i = 0; i < 10; i++)
      scanf(“%d”,&array[i]);
   printf(“Enter value to find\n”);
   scanf(“%d”, &search);
   first = 0;
   last = n –1;
   middle = (first+last)/2;
   while (first <= last) {

      if (array[middle] < search)
        first = middle + 1;
      else if (array[middle] == search) {
        pos=middle+1;
          break;
        }
      else
        last = middle –1;
      }
      if (pos==–1)
        printf(“Not found! %d is not present in the list.\n”, search);
      else
        printf(“\nvalue found at position =%d”,pos);
      return 0;
  }
```

120. Write a program in C to find the maximum occurring character in a string.

```
#include <stdio.h>
#include <string.h>
#include <stdlib.h>
#define str_size 100 //Declare the maximum size of the string
#define chr_no 255 //Maximum number of characters to be allowed
void main()
{
   char str[str_size];
      int ch_fre[chr_no];
   int i = 0, max; int ascii;
      printf("\n\nFind maximum occurring character in a string :\n");
      printf("\n");
      printf("Input the string : ");
      fgets(str, sizeof str, stdin);
      for(i=0; i<chr_no; i++) //Set frequency of all characters to 0
      {
         ch_fre[i] = 0;
       }
    /* Read for frequency of each characters */
      i=0;
      while(str[i] != '\0')
      {
         ascii = (int)str[i];
         ch_fre[ascii] += 1;
         i++;
         }
         max = 0;
         for(i=0; i<chr_no; i++)
```

```
            {
            if(i!=32)
            {
            if(ch_fre[i] > ch_fre[max])
              max = i;
            }
     }
     printf("The Highest frequency of character '%c' appears number of
     times : %d \n\n", max, ch_fre[max]);
}
```

121. Write a program to ask user for any position and display value of array from that position?

```
#include<stdio.h>
# define max 100
int main()
{
int arr[max],i,pos;

for(i=0;i<max;i++)
{
   printf("Enter array elements\n");
   scanf("%d",&arr[i]);
}
printf("\nEnter a position \n");
scanf("%d",&pos);
if(pos<max)
{
   printf("\nvalue at position %d is %d",pos,arr[pos]);
}
else
```

```
{
printf(“\nValue at position %d , does not exist”,pos);
}
return(0);
}
```

CHAPTER 11

Functions – call by value / call by reference

A function is a block of code that performs a specific task. Every C program has at least one function, which ismain().

Depending on whether a function is defined by the user or already included in C compilers, there are two types of functions in C programming:

- Standard library functions
- User-defined functions

The *standard library functions* are built-in functions in C programming to handle tasks such as mathematical computations, I/O processing, and string handling.

These functions are defined in the header file. When you include the header file, these functions are available for use.

C allows programmers to define functions. Such functions created by the user are called as*user-defined functions*.

Depending on the complexity and requirement of the program, one can create as many user-defined functions as one wants.

Advantages of user-defined functions:

- The program is easier to understand, maintain, and debug.
- Reusable codecan be used in other programs.
- A large program can be divided into smaller modules. Hence, a large project can be divided among many programmers.

Creatinga user-defined function

The four factors must be considered when creating a user-defined function:

- Prototype/declaration
- Definition/body
- Call
- Return type

Prototype

A prototype can occur at the top of a C source code file to describe what the function returns and what it takes (return type and parameter list).

When this is the case (occurring at the top of the file), the function prototype should be followed by a semicolon.

Return_type function_name(Argument list...);

Definition

Every function should have a task to perform. Definition should match with prototype.

Return_type function_name(argument list..){}

Call

When one piece of code invokes or calls a function, the number of args "passed" into a function must exactly match the number of parameters required for the function.

The type of each argument must exactly match the type of each parameter. The return variable type must exactly match the return type of the function.

Variable=function_name(argument..);

Return type

When a line of code in a function that says: "return X;" is executed, the function "ends" and no more code in the function is executed.

The value of X (or the value in the variable represented by X) becomes the result of the function.

Argument/Parameter

A parameter is the symbolic name for “data” that goes into a function. There are two ways to pass parameters in C: pass by value and pass by reference.

- Pass by value

Pass by value means that a copy of the data is made and stored by way of the name of the parameter.

Any changes to the parameter have *no* effect on data in the calling function.

- Pass by reference

A reference parameter “refers” to the original data in the calling function.

Thus, any changes made to the parameter cause a *change to the original variable*. Void functions

If a function does not return a value, then a special “TYPE” is used to inform this to the computer. The return type is “void”.

122. Write a function to display the addition of given two numbers.

```
#include<stdio.h>
void addition(int ,int);
void addition(int a,int b)
{
   int c=a+b;
   printf(“\nAddition=%d”,c);
}
void main()
{
int a,b;
   printf(“Enter 2 nos”);
```

```
    scanf("%d%d ",&a,&b);
        addition(a,b);
}
```

123. Write a function to calculate x=(a*b)+10.

```
#include<stdio.h>
# define max 10
void addi(int ,int);
int multi(int,int);
void addi(int a,int b)
{
    int c=a+b;
    printf("\nAddition=%d",c);
}
int multi(int a,int b)
{
    int d=a*b;
    return(d);
}
void main()
{
int a,b, x;
    printf("Enter 2 nos");
    scanf("%d%d ",&a,&b);
    x=multi(a,b);
    addi(x,max);
}
```

124. Write a function to calculate the factorial of given number.

```
#include<stdio.h>
int fact(int);
```

```
int fact(int n)
{
   int i,f=1;
   for(i=1;i<=n;i++)
   {
   f=f*i;
   }
   return(f);
}
int main()
{
   int n,f;
      printf(“enter a no”);
      scanf(“%d”,&n);

   f–fact(n);
   printf(“\nFactorial of %d is %d”,n,f);
}
```

125. Write a program to find the sum of the series 1!/1+2!/2+ 3!/3+4!/4+5!/5 ... !n/n using the user defined function

```
#include<stdio.h>
int fact(int);
int fact(int n)
{
   int i,f=1;
   for(i=1;i<=n;i++)
   {
   f=f*i;
   }
```

```
    return(f);
}
int main()
{/*factorial sum*/
    int n,f,i,sum=0;
        printf("enter a no");
        scanf("%d",&n);
        for(i=1;i<=n;i++)
        {
        f=fact(i)/i;
        sum=sum+f;
        }
        printf("%d",sum);
        return(1);
}
```

126. Write a program to calculate {{(a+b)*(c+d)}+{(e+f)*(g+h)}} using user defined function.

```
#include<stdio.h>
int addi(int,int);
int multi(int,int);
int addi(int a,int b)
{
    int x;
    x=a+b;
    return(x);
}
int multi(int c,int d)
{
    int x;
```

```
    x=c*d;
    return(x);
}
int main()
{
    int a,b,c,d,e,f,g,h,x;
    printf("enter 8 values");
    scanf("%d%d%d%d%d%d%d%d",&a,&b,&c,&d,&e,&f, &g,&h);
    x=sum((multi(sum(a,b),sum(c,d))),(multi(sum(e,f),sum(g,h))));
    printf("%d",x);
return(1);
}
```

127. Write a program to check whether a given number is palindrome or not; create a function to reverse the number.

```
#include<stdio.h>
int reverse();
int input_int();
int input_int()
{
    int n;
    printf("enter a number");
    scanf("%d",&n);
    return(n);
}
int reverse(int n)
{
    int r,s=0;
    while(n!=0)
  { r=n%10;
```

```
    n=n/10;
    s=s*10+r;
  }
    return(s);
}
int main()
{
int a,x;
a=input_int();
 x=reverse(a);
 if(x==a)
{
printf("number is palindrome");
}
else
{
printf("not a palindrome number");
}


}
```

128. Write a program to calculate the area of a circle, and create a function for PI() and square().

```
#include<stdio.h>
float pi();
float pi()
{
   return(3.14);
}
int square(int w)
```

```
{
   return(w*w);
}
void main()
{
   int r;
   float x,area;
   printf("enter radius");
   scanf("%d",&r);
   x=pi();
  //area=(x*r*r);
   area=pi()*square(r);
   printf("area of circle with radius %d is %5.2f",r,area);
}
```

129. Write a program to separate every message by line of the star. Create a function to print the star.

```
#include<stdio.h>
void input_star()
{
   printf("\n**********\n");
}
int main()
{
   input_star();
   input_star();
   printf("good morning");
   input_star();
   printf("good after noon");
   input_star();
```

```
    printf("good evening");
    input_star();
    printf("good night ");
    input_star();
    input_star();
}
```

130. Write a program to create all functions of an ATM.

```
#include<stdio.h>
#include<conio.h>
#include<string.h>
#include<stdlib.h>
int main()
{
char c;
int i,temp=1,amt=10000,ch,rs;
    printf("\nEnter 4 digit ATM pin\n");
    for(i=0;i<4;i++)
    {
    c=getch();
    printf("*");
    if(c!='0')
    {
    temp=0; break;
  }
  }
    if(temp==0)
    printf("\nInvalid pin.Pleasetry again");
    else
    {
```

```
 printf(“\nWelcome user\n”);
 while(1)
 {
printf(“\nWhat do you want?\npress 1 for withdraw\ npress 2 for
deposit\npress 3 for check balance\npress 4 for Logout\n”);
 scanf(“%d”,&ch); switch(ch)
 {
 case 1:
    printf(“\nEnter amount to withdraw\n”);
    scanf(“%d”,&rs);
    if(rs>amt)
    {

    printf(“insufficient balance”);
    }
    else
    {
    amt=amt–rs;
    printf(“\nPleasecollect your amount..\
    nBalance=%d”,amt);
    }
    break;
 case 2:
    printf(“\nEnter amount to withdraw\n”);
    scanf(“%d”,&rs);
    amt=amt+rs;
    printf(“\nBalance=%d”,amt);
    break;
 case 3:
    printf(“\nyou have %d Rs. in
```

```
        balance”,amt);
        break;
      case 4:
      exit(0);
    }
    }
    }
    return 1;
  }
```

131. Write a program to swap two numbers.

```
  #include<stdio.h>
  void interchange(int,int);
    int main()
    {
    int a,b;
    printf(“enter 2 nos”);
    scanf(“%d%d”,&a,&b);
    interchange(a,b);
    printf(“\nAfter change in main() a=%d,
    b=%d”,a,b);
    return 1;
    }
    void interchange(int a,int b)
    {
       int c=a;
       a=b;
       b=c;
    printf(“\nAfter change in interchange() a=%d,
    b=%d”,a,b);
```

```
}
```

132. Write a program to swap two numbers using a pointer.

```
#include<stdio.h>
void interchange(int,int); void swap(int *,int *);
   int main()
   {
      int a,b;
      printf("enter 2 nos");
      scanf("%d%d",&a,&b);

      interchange(a,b);
      printf("\nAfter change in main() a=%d,
      b=%d",a,b);

      swap(&a,&b);
      printf("\nAfter swap in main() a=%d,
      b=%d",a,b); return 1;
   }
   void interchange(int a,int b)
   {
      int c=a;
      a=b;
      b=c;
      printf("\nAfter change in interchange() a=%d,
      b=%d",a,b);
   }
   void swap(int *a,int *b)
   {
      int c=(*a);
```

```
    (*a)=(*b);
    (*b)=c;
    printf("\nAfter change in swap() a=%d, b=%d",*a,*b);
}
```

133. Write a program to calculate the factorial of given number using recursion.

```
#include<conio.h>
int fact(int n)
{
static int f=1;
   if(n==1)
   return 1;
   else
   f=n*fact(n–1);
return(f);
}
void main()
{
int n,f;
   printf("Enter a number");
   scanf("%d",&n);
   f=fact(n);
   printf("\nFactorial=%d",f);
getch();
}
```

134. Write a program to find the largest element of an array using the function.

```
#include<stdio.h>
int findMaxElem(int []);
```

```
int n;
int main()
{
   int arr1[10],mxelem,i;
   printf(" Input %d elements in the array :\n",n);
   for(i=0;i<10;i++)
   {
      printf(" element - %d : ",i);
      scanf("%d",&arr1[i]);
      }
      mxelem=findMaxElem(arr1);

      printf(" The largest element in the array is : %d\n\n",mxelem);
      return 0;
   }
   int findMaxElem(int arr1[])
   {
   int i=1,mxelem; mxelem=arr1[0];
   while(i < 10)
      {
   if(mxelem<arr1[i])
      mxelem=arr1[i];
   i++;
   }
   return mxelem;
}
```

135. Write a program to display the calculator menu.

```
#include <stdio.h>
#include <stdlib.h>
```

```
void displaymenu(){
printf(“ MENU \n”);
printf(“==========================================\n”);
printf(“ 1.Add\n”);
printf(“ 2.Subtract \n”);
printf(“ 3.Multiply \n”);
printf(“ 4.Divide \n”);
printf(“ 5.Modulus \n”);
} int Add(int a,int b){
return(a+b);

}
int Substract(int a, int b){
return(a–b);
} int Multiply(int a, int b){
return(a*b);
}
float Divide(int a,int b){
return(a/b);
}
int Modulus(int a, int b){
return(a%b);
} int main()
{
//show menu
displaymenu();
int yourchoice;
int a;
int b;
```

```
char confirm;
do
{
printf(“Enter your choice(1-5):”);
scanf(“%d:”,&yourchoice);
printf(“Enter your two integer numbers:”);
scanf(“%d %d”,&a,&b);
printf(“\n”);
switch(yourchoice)
{
case 1:
printf(“Result:%d”,Add(a,b));break;
case 2:
printf(“Result:%d”,Substract(a,b));break;
case 3:
printf(“Result:%d”,Multiply(a,b));break;
case 4:

printf(“Result:%.2f”,Divide(a,b));break;
case 5:
printf(“Result:%d”,Modulus(a,b));break;
default:
printf(“invalid”);
}
printf(“\nPress y or Y to continue:”);
scanf(“%s”,&confirm);
}while(confirm==’y’||confirm==’Y’);
return EXIT_SUCCESS;
}
```

136. Write a program to give maximum three chance to user to roll a dice, if he/she gets 1 or 6 print “let’s start” and stop entering number.

```
#include <stdio.h>
#include <stdlib.h>
#include <time.h>

int main()
{
   int lower = 1, upper = 6, count = 3;
   srand(time(0));
// The srand() function sets the starting point for producing a series of pseudo-random integers
   printf(“The random numbers are: “);
   for (int i = 0; i < count; i++) {
    int num = (rand() % (upper - lower + 1)) + lower;
    printf(“\n%d “, num);
     if(num==1 || num==6)
     {     printf(“\t Lets Start ..”);
       break;
     }
   }
   return 0;
}
```

137. Write a program to implement Lift functions of an apartment. Ask the user where he wants to go and go on that floor. Press -1 if reached the destination.

```
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
void goto_floor(int);
```

```
void floor_0()
{
   printf("\n\nYou are now on ground floor\n");
}
void floor_1()
{
   printf("\n\nYou are now on 1st floor\n");
}
void floor_2()
{
   printf("\n\nYou are now on 2nd floor\n");
}
void floor_3()
{
   printf("\n\nYou are now on 3rd floor\n");
}
void floor_4()
{
   printf("\n\nYou are now on 4th floor\n");
}
void floor_5()
{
   printf("\n\nYou are now on 5th floor\n");
}
void goto_floor()
{
int num;
while(1){
printf("\n\tEnter the floor number where you want to go :- (0 to 5)\n");
```

```
  printf("\n\tPress -1 if you reached your destination\n");
  scanf("%d",&num);

  if(num==0)
    floor_0();
  else if (num==1)
    floor_1();
  else if(num==2)
    floor_2();
  else if(num==3)
    floor_3();
  else if(num==4)
    floor_4();
  else if(num==5)
    floor_5();
  else if(num==-1)
    break;
  }
  }
  int main()
  {
  int num;
  printf("\nWe have 5 floors, you can move from 0 to 5\n");
  printf("\nWhen you want to stop press -1 \n");
  goto_floor();

  system("cls");   //to clear screen
  printf("\n\n\n\tHope you reached your destination\n\n\tVisit
Again\n\n");
  return(0);
```

}

Recursion

A function that calls itself is known as a recursive function. And, this technique is known as recursion.

The C programming language supports recursion, that is, a function to call itself.

But, while using recursion, programmers need to be careful to define an exit condition from the function; otherwise, it will go into an infinite loop.

Recursive functions are very useful to solve many mathematical problems, such as calculating the factorial of a number and generating the Fibonacci series.

138. Write a program to find the power of given number using recursion.

```
#include <stdio.h>
/* Power function declaration */
double pow(double base, int expo);
int main()
{
   double base, power;
   int expo;
  /* Input base and exponent from user */
   printf("Enter base: ");
   scanf("%lf", &base);
   printf("Enter exponent: ");
   scanf("%d", &expo);
  // Call pow function power = pow(base, expo);
   printf("%.2lf ^ %d = %f", base, expo, power);
   return 0;
}
```

```
double pow(double base, int expo)
{
 /* Base condition */
   if(expo == 0)
      return 1;
   else if(expo > 0)
      return base * pow(base, expo –1);
   else
      return 1 / pow(base, –expo);
}
```

139. Write a program to display the Fibonacci series using recursion.

```
#include <stdio.h>
void getFibonacii(int a,int b, int n)
{
int sum; if(n>0)
{
   sum=a+b;
   printf("%d ",sum);
   a=b;
   b=sum;
   getFibonacii(a,b,n–1);
  }
}
int main()
{
   int a,b,sum,n;
   int i;
   a=0;  //first term
   b=1;  //second term
```

```
    printf("Enter total number of terms: ");
    scanf("%d",&n);
    printf("Fibonacii series is : ");
    //print a and b as first and second terms of series
    printf("%d\t%d\t",a,b);

    //call function with (n–2) terms getFibonacii(a,b,n–2);
    printf("\n");
    return 0;
}
```

140. Write a program to display the factorial of given number using recursion.

```
#include<stdio.h> int fact(int n)
{
static int f=1;
    if(n==1)
    return 1;
    else
    f=n*fact(n–1);
return(f);
}
void main()
{
int n,f;
    printf("Enter a number");
    scanf("%d",&n);
    f=fact(n);
    printf("\nFactorial=%d",f);
}
```

CHAPTER 12

Pointer

A pointer is used in a C program to access the memory and manipulate the address or the value at address.

A pointer is a variable that contains the address in memory of another variable. We can have a pointer to any variable type.

The *unary* operator & gives the "address of a variable."

The *indirection* or dereference operator * gives the "contents of an object *pointed to* by a pointer."

Some C programming tasks are performed more easily with pointers, and other tasks, such as dynamic memory allocation, cannot be performed without using pointers.

A pointer is a variable whose value is the address of another variable, that is, direct address of the memory location.

Like any variable or constant, we must declare a pointer before using it to store any variable address.

```
datatype *pointer_variable_name;
```

Types of pointers in C are:

- **Null pointer**: A NULL pointer is a pointer that is pointing to nothing.

  ```
  int *ptr=NULL;
  ```

- **Dangling pointer:** A dangling pointer arises when an object is deleted or de-allocated, without modifying the value of the pointer, so that the pointer still points to the memory location of the de-allocated memory.

  ```
  char *ptr = malloc(Constant_Value);

  free (ptr); //ptr now becomes a dangling pointer
  ```

- **Generic pointers:** When a variable is declared as a pointer to type void, it is known as a generic pointer.

  int i; char c;

  void *the_data;

  i = 6; c = ‘a’;

  the_data = &I;

  the_data = &c;

  Wild pointer: A pointer in C that has not been initialized till its first use is known as a wild pointer. A wild pointer points to some random memory location.

  int *ptr;

  // Ptr is a wild pointer, as it is not initialized Yet

  printf(“%d”, *ptr);

141. Write a program to sort an array using a pointer.

```
#include <stdio.h>
void main()
{
   int *a,i,j,tmp,n,a1[100];
   printf(“ Input the number of elements to store in the array : “);
scanf(“%d”,&n);
   printf(“ Input %d number of elements in the array : \n”,n);
for(i=0;i<n;i++)
   {
      printf(“ element - %d : “,i+1);
      scanf(“%d”,&a1[i]);
    }
          a=a1;
   for(i=0;i<n;i++)
   {
   for(j=i+1;j<n;j++)
```

```
    {
       if( *(a+i) > *(a+j))
       {
    tmp = *(a+i);
  *(a+i) = *(a+j);
  *(a+j) = tmp;
  }
  }
}
printf("\n The elements in the array after sorting : \n");
for(i=0;i<n;i++)
    {
    printf(" element - %d : %d \n",i+1,*(a+i));
  }
printf("\n");
}
```

142. Write a program to find the greater number using a pointer and return the pointer.

```
#include <stdio.h>
int* findLarger(int*, int*);
void main()
{
int numa=0;
int numb=0;
int *result;
    printf(" Input the first number : ");
    scanf("%d", &numa);
    printf(" Input the second number : ");
    scanf("%d", &numb);
```

```
result=findLarger(&numa, &numb);
printf(" The number %d is larger. \n\n",*result);
}
int* findLarger(int *n1, int *n2)
{
if(*n1 > *n2) return n1;
else
return n2;
}
```

143. Write a program to generate the possible permutation of a given string.

```
#include<stdio.h>
#include<string.h>
void main()
{
   int n, i, k = 0 ;
   char a[10] ;
   void perm(char a[10], int k, int n) ;
   printf("Enter the string : ") ;
   scanf("%s", a) ;
   printf("\nThe permutation is :\n") ;
   n = strlen(a) ;
   perm(a, k, n) ;
}
void perm(char a[10], int k, int n)
{
   char t, d[10] ;
   int i ;
   if(k == n)
   {
```

```
        printf("\n%s", a) ;
        return ;
    }
    else
    {
        for(i = k ; i < n ; i++)
        {
          t = a[i] ;
          a[i] = a[k] ;
          a[k] = t ;
          strcpy(d, a) ;
          perm(d, k + 1, n) ;
    }
  }
}
```

144. Write a program to find the length of a given string using a pointer.

```
#include <stdio.h>
int calculateLength(char*);
void main()
{
    char str1[25];
    int l;
    printf(" Input a string : ");
    gets(str1);
    l = calculateLength(str1);
    printf(" The length of the given string %s is : %d ", str1, l-1);
    printf("\n\n");
}
```

```
int calculateLength(char* ch) // ch = base address of array str1 ( &str1[0] )
{
    int ctr = 0;
    while (*ch != '\0')
    {
        ctr++;
        ch++;
    }
    return ctr;
}
```

141. Write a program to find the sum of elements of an array using a pointer.

```
#include <stdio.h>
void main()
{
    int arr1[10];
    int i,n, sum = 0;
    int *pt;
    printf(" Input the number of elements to store in the array (max 10) : ");
    scanf("%d",&n);
    printf(" Input %d number of elements in the array : \n",n);
for(i=0;i<n;i++)
    {
        printf(" element - %d : ",i+1);
        scanf("%d",&arr1[i]);
    }
    pt = arr1; // pt store the base address of array arr1
```

```
    for (i = 0; i < n; i++) {
        sum = sum + *pt;
        pt++;
    }
    printf(" The sum of array is : %d\n\n", sum);
}
```

142. Write a program to print a given string in reverse order.

```
#include <stdio.h>
int main()
{
    char str1[50];
    char revstr[50];
    char *stptr = str1;
    char *rvptr = revstr;
    int i=–1;
    printf(" Input a string : ");
    scanf("%s",str1);
    while(*stptr)
    {
    stptr++; i++;
    }
    while(i>=0)
    {
    stptr--;
  *rvptr = *stptr; rvptr++;
  --i;
    }
    *rvptr='\0';
    printf(" Reverse of the string is : %s\n\n",revstr);
```

```
    return 0;
}
```

CHAPTER 13

Structure

A structure is a collection of variables of different types under a single name.

A structure is a user-defined data type in C language, which allows us to combine data of different types together.

A structure helps to construct a complex data type that is more meaningful. It is similar to an array, but an array holds data of similar type only.

By contrast, a structure can store data of any type, which is practically more useful.

Each element of a structure is called a member.

It works like a template in C++ and class in Java. You can have different type of elements in it.

It is widely used to store student information, employee information, product information, book information, and so on. The syntax of a structure is:

```
struct name_of_structure
{members;}
```

To access the members of the structure, we write a variable name of the structure, followed by a dot(.) operator.

A structure can be nested inside another structure. In other words, the members of a structure can be of any other type including the structure.

Its syntax is:

```
structure tagname_1
{
   member1;
```

```
    member2;
    member3;
    ...
    membern;

    structure tagname_2
    {
        member_1;
        member_2;
        member_3;
        ...
        member_n;
  }, var1
} var2;
```

To access the members of the inner structure, we write a variable name of the outer structure, followed by a dot(.) operator, followed by the variable of the inner structure, followed by a dot(.) operator.

143. Write a program to create a structure "student,"access its members and display the details.

```
#include<stdio.h>
struct stu
{
  //member of structure
    char name[10];
    int age;
};
void main()
{
struct stu A,b; //variable of structure to access its member
```

```
printf(“Enter name of student\n”);
scanf(“%s”,A.name); // . Operator is used to access member
printf(“\nEnter age of student\n”);
scanf(“%d”,&A.age);
printf(“Enter name of student\n”);
scanf(“%s”,b.name); // . Operator is used to access member
printf(“\nEnter age of student\n”);
scanf(“%d”,&b.age);

printf(“\n%s is %d years old”,A.name,A.age);
printf(“\n%s is %d years old”,b.name,b.age);
}
```

144. Write a program to create a structure and read data of 10 students.

```
#include<stdio.h>
struct stu
{
  //member of structure
    char name[10];
    int age;
};
void main()
{
struct stu a[3];
    int i;
    for(i=0;i<3;i++)
    {
    printf(“Enter name of student\n”);
    scanf(“%s”,a[i].name);
  //. operator is used to access member
```

```
    printf("\nEnter age of student\n"); scanf("%d",&a[i].age);
  }
    for(i=0;i<3;i++)
    {
    printf("\n%s is %d years old",a[i].name,a[i].age);
  }
}
```

145. Write a program to create a global variable of a structure and use it.

```
 #include<stdio.h>
struct stu
{
   char name[10];
   int age;
};s;
void main()
{
   printf("Enter name and age ");
   scanf("%s%d",s.name,&s.age);
   printf("\n%s is %d years old",s.name,s.age);
}
```

146. Write a program to create a structure using function.

```
#include<stdio.h>
struct stu
{
char n[10];
};s;
void read()
{
   printf("\nEnter name");
```

```
    scanf("%s",s.n);
}
void show()
{
    printf("\nHello %s",s.n);
}
void main()
{
    read();
    show();
}
```

147. Write a menu-driven program to read or write details of a structure "student."

```
#include<stdio.h>
#include<stdlib.h>
struct student
{
    char cou[10];
    float fee;
};
struct student read()
{
    struct student s;
    printf("\nEnter course and fee");
    scanf("%s%f",s.cou,&s.fee);
    return s;
}
void show(struct student s)
{
```

```
printf("\nstudent doing %s and paid fee %5.2f",s.cou,s.fee);
}
int main()
{
    struct student s[100];
    int c,i=0,j;



    while(1)
    {
   printf("Enter choice:\nPress 1 for new record\nPress 2 for display
   all\nPress any number for exit\n");
    scanf("%d",&c);
    switch(c)
    {


case 1:
    s[i++]=read();
    system("cls"); //clears screen
    break;
case 2:
    for(j=0;j<i;j++)
    show(s[j]);
    break;
default:
    exit(1);
  }
  }
return 0;
}
```

148. Write a program to use a nested structure.

```
#include<stdio.h>
//Example of nested structure struct dates
{
int d,m,y;
};
struct stu
{
   char name[10];
   struct dates dob,doj;
   float fee;
};
void main()
{
struct stu a;
   printf("Enter name\n ");
   scanf("%s",a.name);
   printf("\nEnter date of birth\n");
   scanf("%d%d%d",&a.dob.d,&a.dob.m,&a.dob.y);
   printf("\nEnter date of joining\n");
   scanf("%d%d%d",&a.doj.d,&a.doj.m,&a.doj.y);
   printf("\nEnter fee\n");
   scanf("%f",&a.fee);
   printf("\n----Details---\n");
   printf("\nName:\t%s",a.name);
   printf("\nDOB:\t%d\\%d\\%d",a.dob.d,a.dob.m,a.dob.y);
   printf("\nDOJ:\t%d\\%d\\%d",a.doj.d,a.doj.m,a.doj.y);
   printf("\nFee:\t%5.2f",a.fee);
}
```

149. Write a program to created more than one nested structure.

```
#include<stdio.h>
struct dates
{
int d,m,y;
};
struct student
{
char name[20],course[20];
struct dates dob,doj;
float fee;
};
struct employee
{
char name[20];
struct dates dob,doj;
float salary;
};
int main()
{
struct student a;
struct employee b;
int c;
printf("enter choice 1 or 2");
scanf("%d",&c);
switch(c)
{
case 1:
printf("Enter name of student\n ");
```

```
fflush(stdin);
gets(a.name);
printf("\nEnter date of birth\n");
scanf("%d%d%d",&a.dob.d,&a.
dob.m,&a.dob.y);
printf("\nEnter date of joining\n");
scanf("%d%d%d",&a.doj.d,&a.
doj.m,&a.doj.y);
printf("\nEnter course\n");
scanf("%s",&a.course);
printf("\nEnter fee\n");
scanf("%f",&a.fee);
printf("\n----Details---\n");
printf("\nName:\t%s",a.name);
printf("\nDOB:\t%d\\%d\\%d",a.
dob.d,a.dob.m,a.dob.y);
printf("\nDOJ:\t%d\\%d\\%d",a.doj.d,a.
doj.m,a.doj.y);
printf("\nCourse:\t%s",a.course);
printf("\nFee:\t%5.2f",a.fee);
break;
case 2: printf("Enter name of employee\n ");
scanf("%s",b.name);
printf("\nEnter date of birth\n");
scanf("%d%d%d",&b.dob.d,&b.
dob.m,&b.dob.y);
printf("\nEnter date of joining\n");
scanf("%d%d%d",&b.doj.d,&b.
doj.m,&b.doj.y);
```

```
printf("\nsalary\n");
scanf("%f",&b.salary);
printf("\n----Details---\n");

printf("\nName:\t%s",b.name);
printf("\nDOB:\t%d\\%d\\%d",b.
dob.d,b.dob.m,b.dob.y);
printf("\nDOJ:\t%d\\%d\\%d",b.doj.d,b.
doj.m,b.doj.y);
printf("\nSalary:\t%5.2f",b.salary);
break;
default: printf("Invalid");
}
}
```

Union

A union is a special datatype available in C,which allows to store different datatypes in the same memory location. We can define a union with many members, but only one member can contain a value at any given time.

Difference between a structure and union

	Structure	**Union**
Memory allocation	Members of structure do not share memory. So, a structure needs separate memory space for all its members, that is, all the members have unique storage.	A union shares the memory space among its members, so there is no need to allocate memory to all the members. Shared memory space is allocated, that is, equivalent to the size of member having largest memory.

	Structure	Union
Member access	Members of a structure can be accessed individually at any time.	At a time, only one member of union can be accessed.
Keyword	To define a structure, the *struct*keyword is used.	To define a union, the *union*keyword is used.
Initializa-tion	*All* members of a structure can be initialized.	*Only* the *first* member of the union can be initialized.
Size	Size of the structure is > to the sum of the each member's size.	Size of the union is equivalent to the size of the member having the *largest* size.
Syntax	struct struct_name { structure ele 1; structure ele 2; ———- ———- structure ele n; }struct_variable_name;	union union_name { union ele 1; union ele 2; ———- ———- union ele n; }union_variable_name;
Change in value	Change in the value of one member cannot affect the other in the structure.	Change in the value of one member can affect the value of other member.

150. Write a program to display the difference between a structure and union.

```
#include<stdio.h>
struct info
{
char n[10];
int a;
};
```

```
union infor
{
char n[10];
int a;
};
void main()
{
    struct info i;
    union infor i1;
    printf("\nSizeof a=%d , n=%d,i is %d",sizeof(i.a),sizeof(
i.n),sizeof(i));
    printf("\n\nSizeof a=%d , n=%d,i1 is %d",sizeof(i1.a),si
zeof(i1.n),sizeof(i1));
    printf("\n\nEnter string and number"); scanf("%s%d",i.n,&i.a);
    printf("\n\nStruct variable:%s\t%d",i.n,i.a);
    printf("\n\nEnter string and number"); scanf("%s%d",i1.n,&i1.a);
    printf("\n\nunion variable:%s\t%d",i1.n,i1.a);
}
```

Typedef

typedef can be used to give a type a new name.

151. Write a program to display the use of a *typedef*statement.

```
#include<stdio.h>
void main()
{
typedef int myname; myname b=34; printf("\nval=%d",b);
}
```

152. Write a program to display the use of a typedef statement in a structure.

```
#include<stdio.h>
Void main()
{
struct stu
{
  //member of structure
    char name[10];
    int age;
};
void main()
{
typedef struct stu student;
student a;
    printf("Enter name and age of student");
    scanf("%s%d",a.name,&a.age);
    printf("\n%s is %d years old",a.name,a.age);
}
```

153. Write a program to read and write data of a structure using a pointer.

```
#include<stdio.h>
struct student
{
    char course[10];
    float fee;
};
void main()
{
struct student *s;

printf("enter course and fee of student");
```

```
scanf("%s%f",s->course , &s->fee);

printf("\ndetails of student\n");
printf("She/he is doing %s and paid %f",s->course,s->fee);
}
```

154. Write a program to add two distances (feet–inch system) and display the result without the return statement.

```
#include <stdio.h>
struct distance
{
   int feet;
   float inch;
};
void add(struct distance d1,struct distance d2, struct distance
*d3);
int main()
{
   struct distance dist1, dist2, dist3;

   printf("First distance\n");
   printf("Enter feet: ");
   scanf("%d", &dist1.feet);
   printf("Enter inch: ");
   scanf("%f", &dist1.inch);

   printf("Second distance\n");
   printf("Enter feet: ");
   scanf("%d", &dist2.feet);
   printf("Enter inch: ");
```

```
    scanf("%f", &dist2.inch);

    add(dist1, dist2, &dist3);
   //passing structure variables dist1 and dist2 by value whereas passing
   structure variable dist3 by reference
    printf("\nSum of distances = %d\'-%.1f\"", dist3.feet, dist3.inch);

    return 0;
}
void add(struct distance d1,struct distance d2, struct distance
*d3)
{
  //Adding distances d1 and d2 and storing it in d3
    d3->feet = d1.feet + d2.feet;
    d3->inch = d1.inch + d2.inch;
    if (d3->inch >= 12) {  /* if inch is greater or equal to 12, converting it
to feet. */
    d3->inch -= 12;
  ++d3->feet;
  }
}
```

CHAPTER 14

Dynamic memory allocation

The process of allocating memory during program execution is called dynamic memory allocation.

Dynamic memory management refers to manual memory management. This allows us to obtain more memory when required and release it when not necessary.

Dynamic memory allocation funcytions in C are summarized in the following table:

Function	Syntax
malloc ()	malloc (number *sizeof(int));
calloc ()	calloc (number, sizeof(int));
realloc ()	realloc (pointer_name, number * sizeof(int));
free ()	free (pointer_name);
Function	Use of the function
malloc()	Allocates the requested size of bytes and returns a pointer the first byte of the allocated space
calloc()	Allocates space for an array's elements, initializes to zero, and then returns a pointer to memory
free()	De-allocates the previously allocated space
realloc()	Changes the size of previously allocated space

155. Write a program to use a structure's member through a pointer using the malloc() function.

```
#include <stdio.h>
```

```
#include <stdlib.h>
struct person {
    int age;
    float weight; char name[30];
  };
int main()
{
    struct person *ptr;
    int i, num;
    printf("Enter number of persons: ");
    scanf("%d", &num);
    ptr = (struct person*) malloc(num * sizeof(struct person));
   // Above statement allocates the memory for n structures with pointer
   person Ptr pointing to base address.
    for(i = 0; i < num; ++i)
{
    printf("Enter name, age and weight of the person
    respectively:\n");
    scanf("%s%d%f", &(ptr+i)->name, &(ptr+i)->age, &(ptr+i)-
  >weight);
}
    printf("Displaying Infromation:\n");
    for(i = 0; i < num; ++i)
    printf("%s\t%d\t%.2f\n", (ptr+i)->name, (ptr+i)->age, (ptr+i)-
>weight);
    return 0;
}
```

156. Write a program to create memory for int, char, and float variables at runtime.

```
#include <stdio.h>
```

```
#include <stdlib.h>
int main()
{
   int *iVar;
   char *cVar;
   float *fVar;
  /*allocating memory dynamically*/
   iVar=(int*)malloc(1*sizeof(int));
   cVar=(char*)malloc(1*sizeof(char));
   fVar=(float*)malloc(1*sizeof(float));
   printf("Enter integer value: ");
   scanf("%d",iVar);
   printf("Enter character value: ");
   scanf(" %c",cVar);
   printf("Enter float value: ");
   scanf("%f",fVar);
   printf("Inputted value are: %d, %c, %.2f\ n",*iVar,*cVar,*fVar);
  /*free allocated memory*/ free(iVar);
   free(cVar);
   free(fVar);
   return 0;
}
```

157. Write a program to input and print a name using dynamic memory allocation.

```
int main()
{
   int n;
   char *name;
   printf("Enter limit of the text: ");
```

```
  scanf("%d",&n);
 /*allocate memory dynamically*/
  text=(char*)malloc(n*sizeof(char));
  printf("Enter text: ");
  scanf(" "); /*clear input buffer*/ gets(name);
  printf("Inputted text is: %s\n",name);
 /*Free Memory*/ free(name);
  return 0;
}
```

158. Write a program to read a one D array, print the sum of all elements along with inputted array elements using dynamic memory allocation.

```
#include <stdio.h>
#include <stdlib.h>
int main()
{
  int *arr;
  int limit,i;
  int sum=0;
  printf("Enter total number of elements: ");
  scanf("%d",&limit);
 /*allocate memory for limit elements dynamically*/
  arr=(int*)malloc(limit*sizeof(int));
  if(arr==NULL)
  {
    printf("Insufficient Memory, Exiting... \n");
    return 0;
  }
  printf("Enter %d elements:\n",limit);
  for(i=0; i<limit; i++)
```

```
    {
       printf("Enter element %3d: ",i+1);
       scanf("%d",(arr+i));
       /*calculate sum*/ sum=sum + *(arr+i);
    }
    printf("Array elements are:");
    for(i=0; i<limit; i++)
       printf("%3d ",*(arr+i));

    printf("\nSum of all elements: %d\n",sum);
    return 0;
}
```

159. Write a program to read andprintthe student details using a structure and dynamic memory allocation.

```
#include <stdio.h>
#include <stdlib.h>
/*structure declaration*/ struct student
{
   char name[30];
   int roll;
   float perc;

};
int main()
{
   struct student *st;
  /*Allocate memory dynamically*/
   st=(struct student*)malloc(1*sizeof(struct student));
   if(st==NULL)
```

```
    {
       printf("Insufficient Memory, Exiting... \n");
       return 0;
    }
    /*read and print details*/
    printf("Enter name: ");
    gets(st->name);
    printf("Enter roll number: ");
    scanf("%d",&st->roll);
    printf("Enter percentage: ");
    scanf("%f",&st->perc);
    printf("\nEntered details are:\n");
    printf("Name: %s, Roll Number: %d, Percentage: %.2f\n",st-
>name,st->roll,st->perc);
    return 0;
}
```

160. Write a program to allocate memory at runtime for an array.

```
#include <stdio.h>
#include <stdlib.h> int main()
{
 int n,i,*p;
 printf("Enter number of elements: ");
 scanf("%d",&n);
 p=(int*)calloc(n, sizeof(int));
 if(p == NULL)
 {
     printf("memory cannot be allocated\n");
 }
 else
```

```
{
printf("Enter elements of array:\n");
for(i=0;i<n;++i)
{
    scanf("%d",&*(p+i));
}
printf("Elements of array are\n");
for(i=0;i<n;i++)
{
    printf("%d\n",*(p+i));
}
}
return 0;
}
```

161. Write a program to use realloc.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h> int main()
{
 char *p1;
 int m1, m2;
 m1 = 10;
 m2 = 20;
 p1 = (char*)malloc(m1);
 strcpy(p1, "Swati");
 p1 = (char*)realloc(p1, m2);
 strcat(p1, "Computers");
 printf("%s\n", p1);
 return 0;
```

}

CHAPTER 15

File handling

File is a collection of bytes that are stored in secondary storage devices such as a disc. There are two types of files in a system. They are:

- Text files
- Binary files

Text files contain ASCII codes of digits, alphabets, and symbols.

Binary files contain collection of bytes (0s and 1s). Binary files are a compiled version of text files.

Basic file operations in C

The basic file operations in C are as follows:

1. Creating a new file (fopen with attributes as “a”,“a+”, “w”, or “w++”).
2. Opening an existing file (fopen).
3. Reading from the file (fscanf or fgetc).
4. Writing to a file (fprintf or fputs).
5. Moving to a specific location in a file (fseek, rewind).
6. Closing a file (fclose).

The syntax for the baic file operations is:

```
FILE *fp;

Fp=fopen(“Name of file”, “mode”);
```

Modes of operation in file are as follows:

- r: Opens a file in read mode and sets the pointer to the first character in the file. It returns null if the file does not exist.

- w: Opens a file in write mode. It returns null if the file could not be opened. If the file exists, data is overwritten.
- a: Opens a file in append mode. It returns null if the file does notopen.
- r+: Opens a file in read and write mode and sets the pointer to the first character in the file.
- w+: Opens a file in read and write mode and sets the pointer to the first character in the file. if the file to be opened does not exist, it gets created.
- a+: Opens a file in read and write mode and sets the pointer to the first character in the file. But, it cannot modify the existing contents.

File handling functions	**Description**
fopen ()	The fopen () function creates a new file or opens an existing file.
fclose ()	The fclose () function closes an opened file.
getw ()	The getw () function reads an integer from a file.
putw ()	The putw () function writes an integer to a file.
fgetc ()	The fgetc () function reads a character from a file.
fputc ()	The fputc () function writes a character to a file.
gets ()	The gets () function reads a line from the keyboard.
puts ()	The puts () function writes a line to the output screen.
fgets ()	The fgets () function reads a string from a file, one line at a time.
fputs ()	The fputs () function writes a string to a file.
feof ()	The feof () function finds the end of a file.
fgetchar ()	The fgetchar () function reads a character from the keyboard.

File handling functions	Description
fprintf ()	The fprintf () function writes formatted data to a file.
fscanf ()	The fscanf () function reads formatted data from a file.
fputchar ()	The fputchar () function writes a character onto the output screen from the keyboard input.
fseek ()	The fseek () function moves the file pointer position to a given location.
SEEK_SET	SEEK_SET moves the file pointer position to the be- ginning of the file.
SEEK_CUR	SEEK_CUR moves the file pointer position to a given location.
SEEK_END	SEEK_END moves the file pointer position to the end of the file.
ftell ()	The ftell () function gives the current position of the file pointer.
rewind ()	The rewind () function moves the file pointer position to the beginning of the file.
getc ()	The getc () function reads a character from a file.
getch ()	The getch () function reads a character from the key- board.
getche ()	The getche () function reads a character from the key- board and echoes to the output screen.
getchar ()	The getchar () function reads a character from the keyboard.
putc ()	The putc () function writes a character to a file.

File handling functions	Description
putchar ()	The putchar () function writes a character to the screen.
printf ()	The printf () function writes formatted data to the screen.
sprinf ()	The sprinf () function writes formatted output to a string.
scanf ()	The scanf () function reads formatted data from the keyboard.
sscanf ()	The sscanf () function reads formatted input from a string.
remove ()	The remove () function deletes a file.
fflush ()	The fflush () function flushes a file.

162. Write a program to open an existing file and read it character-by-character.

```
#include<stdio.h>
void main()
{
FILE *fp,*fp1;
char c;
   fp=fopen("sz.c","r");
   if(fp==NULL)
   printf("\nFile does not exist");
   while(1)
   {
   c=fgetc(fp); //read char from sz.c
   if(c==EOF) break; printf("%c",c);
```

```
    }
    fclose(fp);
}
```

163. Write a program to copy an existing file.

```
#include<stdio.h>
void main()
{
FILE *fp,*fp1;
char c;
    fp=fopen("sz.c","r");
    fp1=fopen("sz1.c","w");
    if(fp==NULL)
    printf("\nFile does not exist");
    while(1)
    {
    c=fgetc(fp); //read char from sz.c
    if(c==EOF) break;
    fputc(c,fp1); //write char into sz1.c
    //printf("%c",c);
    }
    printf("\nFile created");
    fclose(fp);
    fclose(fp1);
}
```

164. Write a program to count the number of vowels in a given file.

```
#include<stdio.h>
int main()
{
    FILE *fp;
```

```
    char c;
    int x=0;
    fp=fopen("sz1.c","r");
    while(1)
    {
       c=fgetc(fp);
       if(c==EOF) break;
       else if(c=='a'||c=='e'||c=='i'||c=='o'||c=='u')
       x++;
}
    printf("\n%d",x);
    fclose(fp);
    return(0);
}
```

165. Write a program to print names of all students from a file.

```
#include<stdio.h>
void main()
{
FILE *fp,*fp1;
char name[10];
    fp=fopen("student_name.c","r");
    while(fgets(name,9,fp))
    {
    printf("%s",name);
    }
    fclose(fp);
}
```

166. Write a program to input name of a student and update in an existing file.

```
#include<stdio.h>
void main()
{
FILE *fp1;
char name[10
   fp1=fopen("student_name.c","a");
   printf("\nEnter ur name");
   gets(name);
   fputs(name,fp1); // write string into sz1.c
   printf("\nFile updated");
   fclose(fp1);
}
```

167. Write a program to create a copy of a file, but replace all *i* with *I.*

```
#include<stdio.h>
void main()
{
   FILE *fp,*fp1;
   char c;
   fp=fopen("sz1.c","r");
   fp1=fopen("sz2.c","w");
   while(1)
   {
      c=fgetc(fp);
      if(c==EOF) break;
      else if(c=='i') c='I';
      fputc(c,fp1);
   }
   printf("\n File Created");
   fclose(fp);
```

```
    fclose(fp1);
}
```

168. Write a program to input data of students as a structure variable and write into a file.

```
#include<stdio.h>
#include<conio.h>
struct stu
{
  //member of structure
    char name[10]; int age;
    char phn[10];
};
void main()
{
    struct stu s;
    FILE *fp;
    fp=fopen("strct1.c","w");
    printf("Enter name of student\n");
    scanf("%s",s.name); // . Operator is used to access member
    printf("\nEnter age of student\n");
    scanf("%d",&s.age);
    fflush(stdin);
    printf("\nEnter phone");
    gets(s.phn);
    fwrite(&s,sizeof(s),1,fp);
    fclose(fp);
}
```

169. Write a program to read the structure variable from a file.

```
#include<stdio.h>
```

```
#include<conio.h>
struct stu
{
  //member of structure
    char name[10];
    int age;
    char phn[10];
};
    void main()
{
    struct stu s;
    FILE *fp;
    fp=fopen("strct1.c","r");
    fread(&s,sizeof(s),1,fp);
    printf("\nname=%s\tage=%d\tphone=%s",s.name,s.
    age,s.phn);
    fclose(fp);
}
```

170. Write a program to read the file and store the lines into an array.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#define LSIZ 128
#define RSIZ 10
int main(void)
{
    char line[RSIZ][LSIZ];
        char fname[20];
    FILE *fptr = NULL; int i = 0;
```

```
    int tot = 0;
    printf(" Input the filename to be opened : ");
    scanf("%s",fname);
    fptr = fopen(fname, "r");
    while(fgets(line[i], LSIZ, fptr))
{
    line[i][strlen(line[i]) –1] = '\0';
    i++;
    }
    tot = i;
    printf("\n The content of the file %s are : \n",fname);
    for(i = 0; i < tot; ++i)
{
    printf(" %s\n", line[i]);
    }
    printf("\n"); return 0;
}
```

171. Write a program to encrypt a file.

```
#include <stdio.h>
#include <stdlib.h>
void main()
{
char fname[20], ch;
FILE *fp, *fp1;
printf(" Input the name of file to encrypt : ");
scanf("%s",fname);
fp=fopen(fname, "r");
if(fp==NULL)
{
```

```
printf(“ File does not exists or error in
opening..!!”);
exit(1);
}
Fp1=fopen(“temp.txt”, “w”);
if(fp1==NULL)
{
printf(“ Error in creation of file temp.txt ..!!”);
fclose(fp);
exit(2);
}
while(1)
{
ch=fgetc(fp);
if(ch==EOF)
{
break;
}
else
{
ch=ch+100;
fputc(ch, fp1);
}
}
fclose(fp);
fclose(fp1);
fp=fopen(fname, “w”);
if(fp==NULL)
{
```

```
printf(“ File does not exists or error in opening..!!”);
exit(3);
}
Fp1=fopen(“temp.txt”, “r”);
if(fp1==NULL)
{
printf(“ File does not exists or error in opening..!!”);
fclose(fp);
exit(4);
}
while(1)
{
ch=fgetc(fp1);
if(ch==EOF)
{
break;
}
else
{
fputc(ch, fp);
}
}
printf(“ File %s successfully encrypted ..!!\n\n”, fname);
fclose(fp);
fclose(fp);
}
```

172. Write a program to decrypt a file.

```
#include <stdio.h>
#include <stdlib.h>
```

```
void main()
{
   char ch, fname[20];
   FILE *fp, *fp1;
   printf(“ Input the name of file to decrypt : “);
   scanf(“%s”,fname);
   fp=fopen(fname, “w”);
   if(fp==NULL)
   {
      printf(“ File does not exists or error in
      opening..!!”);
      exit(7);
   }
      fp1=fopen(“temp.txt”, “r”);
      if(fp1==NULL)
   {
      printf(“ File does not exists or error in
      opening..!!”);
      fclose(fp);
      exit(9);
   }
   while(1)
   {
      ch=fgetc(fp1);
      if(ch==EOF)
      {
      break;
      }
      else
```

```
        {
        ch=ch–100;
        fputc(ch, fp);
        }
    }
      printf(“ The file %s decrypted successfully..!!\n\
      n”,fname);

      fclose(fp);
      fclose(fp1);
  }
```

173. Write a program to display use of enum.

```
  #include <stdio.h>
  enum course {C,JAVA,VB,HTML,JS};
  int main()
  {
     enum course cou;
     cou = JAVA;
     printf(“course is %d”,cou+1);
     return 0;
  }
```

174. Write a program to display the use of sprintf().

```
  #include <stdio.h>
  int main()
  {
     char str[20];
        char course[10];
        float fee,f;
  printf(“enter course and fee”);
```

```
        scanf("%s%f",course,&fee);

        sprintf(str,"%s:%f",course,fee);
        puts(str);
    return 0;
    }
```

175. Write a program to display the use of sscanf().

```
    #include <stdio.h>
    int main ()
    {
       char buffer[30]="Swati Computers ";
       char First[20],Second[10];
       sscanf (buffer,"%s %s",First,Second);
       printf (" %s - %s \n",First,Second);
       return 0;
    }
```

176. Write a program to displaythe use of getch(),putch(), getchar(), putchar(), gets(), and puts().

```
    #include <stdio.h>
    #include<conio.h>
    int main ()
    {
       char ch,str[50];
          printf("Enter a character");
          ch=getch();
          printf("\nU have input:");
          putch(ch);
          printf("\n\nEnter a character");
          ch=getchar();
```

```
        printf("u have input:");
        putchar(ch);
        fflush(stdin);
        printf("\n\nEnter a string");
        gets(str);
        printf("u have input:");
        puts(str);
    return 0;
}
```

CHAPTER 16

Bitwise Operators

- Bitwise operators are used to perform bit operations.

  Decimal values are converted into binary values, which are the sequence of bits, and bitwise operators work on these bits.
- Bitwise operators in the C language are & (bitwise AND), | (bitwise OR), ~ (bitwise NOT), ^ (XOR), << (left shift), and >> (right shift).

Truth table for bitwise operations and bitwise operators.

First Value	Second value	AND	OR	XOR
0	0	0	0	0
0	1	0	1	1
1	0	0	1	1
1	1	1	1	0

There are two bitwise shift operators. They are:

- Right shift (>>)
- Left shift (<<)

177. Write a program to use the bitwise AND (&) operator.

```
#include <stdio.h>
#include<conio.h>
int main ()
{
int a = 12, b = 25;
printf("Output = %d", a&b);
return 0;
```

```
}
```
Explanation:

12 = 00001100 (in Binary)

25 = 00011001 (in Binary)

Bit operation of 12 and 25

00001100

& 00011001

00001000 = 8 (in decimal)

178. Write a program to use the bitwise OR (|) operator.

```
#include <stdio.h>
#include<conio.h>
int main ()
{
int a = 12, b = 25;
   printf("Output = %d", a|b);
return 0;
}
```
Explanation:

12 = 00001100 (in Binary)

25 = 00011001 (in Binary)

Bitwise OR operation of 12 and 25

00001100

00011001

00011101 = 29 (in decimal)

179. Write a program to use the bitwise XOR (^) operator.

```
#include <stdio.h>
```

```
#include<conio.h>
int main ()
{
int a = 12, b = 25;
   printf("Output = %d", a^b);
return 0;
}
```

Explanation:

12 = 00001100 (in Binary)

25 = 00011001 (o=in Binary) Bitwise XOR operation of 12 and 25

00001100

00011001

00010101 = 21 (in decimal)

180. Write a program to use the bitwise complement operator (~).

```
#include <stdio.h>
#include<conio.h>
int main ()
   int b = 35;
   printf("Output = %d", ~b);
   return 0;
   }
```

Explanation:

35 = 00100011 (in Binary)

Bitwise complement operation of 35

~ 00100011

_____

11011100 = 220 (in decimal)

181. Write a program to use shift operators.

```
#include <stdio.h>
int main()
{
int num=212, i;
for (i=0; i<=2; ++i)
   printf("Right shift by %d: %d\n", i, num>>i);
printf("\n");
for (i=0; i<=2; ++i)
   printf("Left shift by %d: %d\n", i, num<<i);
return 0;
}
```

212 = 11010100 (in binary)

212>>2 = 00110101 (in binary) [right-shift by two bits]

212 = 11010100 (in binary)

212<<1= 110101000 (in binary) [left-shift by one bit]

CHAPTER 17

Miscellaneous

Enum

Enumeration (or enum) is a user-defined datatype in C. It is mainly used to assign names to integral constants, the names make a program easy to read, and maintain.

```
#include <stdio.h>
enum course {C,JAVA,VB,HTML,JS};
int main()
{
   enum course cou;
   cou = JAVA;
   printf("course is %d",cou+1);
   return 0;
}
```

Header files

A header file in the C programming language is a file with .h extension,which contains a set of common function declarations and macro definitions that can be shared across multiple program files.

The C language provides a set of in-built header files that contain commonly used utility functions and macros.

Types of header files in C

- .User-defined header files.
- In-built header files

The syntaxes of a header file are:

#include <Header_file_name>

#include “Header_file_name”

C standard library header file

<assert.h>	Conditionally compiled macro that compares its argument with zero
<complex.h> (since C99)	Complex number arithmetic
<ctype.h>	Functions to determine the type contained in the character data
<errno.h>	Macros reporting error conditions
<fenv.h> (since C99)	Floating-point environment
<float.h>	Limits of float types
<inttypes.h> (since C99)	Format conversion of integer types
<iso646.h> (since C95)	Alternative operator spellings
<limits.h>	Sizes of basic types
<locale.h>	Localization utilities
<math.h>	Common mathematics functions
<setjmp.h>	Non-local jumps
<signal.h>	Signal handling
<stdalign.h> (since C11)	Alignas and alignof convenience macros
<stdarg.h>	Variable arguments
<stdatomic.h> (since C11)	Atomic types
<stdbool.h> (since C99)	Boolean type

<assert.h>	Conditionally compiled macro that compares its argument with zero
<stddef.h>	Common macro definitions
<stdint.h> (since C99)	Fixed-width integer types
<stdio.h>	Input/output
<stdlib.h>	General utilities: memory management, program utilities, string conversions, and random numbers
<stdnoreturn.h> (since C11)	noreturn convenience macros
<string.h>	String handling
<tgmath.h> (since C99)	Type-generic math (macros wrapping math.h and complex.h)
<threads.h> (since C11)	Thread library
<time.h>	Time/date utilities
<uchar.h> (since C11)	UTF-16 and UTF-32 character utilities
<wchar.h> (since C95)	Extended multibyte and wide character utilities
<wctype.h> (since C95)	Functions to determine the type contained in the wide character data

Macro- and preprocessor in C

In a C program, all lines starting with a hash (#) are processed by a preprocessor that is a special program invoked by the compiler. In a very basic term, preprocessor takes a C program and produces another C program without any #.

1. The following are some interesting facts about preprocessors in C:

When we use the include directive, the contents of included header file (after preprocessing) are copied to the current file.

Angular brackets < and > instruct the preprocessor to look in the standard folder where all header files are held.

2. Double quotes “and” instruct the preprocessor to look into the current folder, and if the file is not present in the current folder, then it looks in the standard folder of all header files.

When we use define for a constant, the preprocessor generates a C program where the defined constant is searched, and matching tokens are replaced with the given expression.

In the C programming language, the #define directive allows the definition of macros within the source code.

These macro definitions allow constant values to be declared for use throughout the code.

Macro definitions are not variables and cannot be changed by our program code, like variables.

We generally use this syntax when creating constants that represent numbers, strings, or expressions.

The syntax for #define is:

#define Constant_name value #define Constant_name (Expression)

Some are #if, #elif, #else, and #endif directives.

The #if directive, with the #elif, #else, and #endifdirectives, controls compilation of portions of a source file.

If the expression we write (after the #if) has a non-zero value, the line group immediately following the #if directive is retained in the translation unit.

CHAPTER 18

Extra Questions

1. What arethe outputs of the following programs?

```
#include <stdio.h>
using namespace std;
int main()
{
int a = 21;
int c ;
c = a++;
printf("%d",c);
return 0;
}
```

Answer: 21

2.
```
#include <stdio.h>
using namespace std;
int main()
{
int x = 5, y = 5;
Printf("%d %d",++x,--y;
return 0;
}
```

Answer: 6 4

3.
```
int main()
{
```

```
int x = 5, y = 5, z;
x = ++x;
y = --y;
z = x++ + y--;
printf("%d",z);
return 0;
}
```

Answer: 10

4.
```
int main()
{
int num1 = 5;
int num2 = 3;
int num3 = 2;
num1 = num2++;
num2 = --num3;
printf("%d %d %d",num1,num2,num3);

return 0;
}
```

Answer: 3 1 1

5.
```
#include <stdio.h>
int main()
{
int a = 1, b = 1, c;
c = a++ + b;
printf("%d, %d", a, b);
}
```

Answer: a=2 , b=1

6. void main(){
   int i=5,j=10,num;
   num=(++i,++j,i+j);
   printf(“%d %d %d”,num,i,j);
   }

Answer: 17 6 11

7. void main()
   {
   int i=5;
   printf(“%d”,i+++++i);
   }

Answer: Compiler error

8. int main()
   {
   FILE *fp1, *fp2;
   fp1=fopen(“file.c”, “w”);
   fp2=fopen(“file.c”, “w”);
   fputc(‘A’, fp1);
   fputc(‘B’, fp2);
   fclose(fp1);
   fclose(fp2);
   return 0;
   }

Answer: B

9. int main()
   {
   int k=1;
   printf(“%d == 1 is” “%s\n”, k, k==1?”TRUE”:”FALSE”);

```
return 0;
}
```

Answer : 1=1 is TRUE

10.
```
char *str = “char *str = %c%s%c;
main(){ printf(str, 34, str, 34);}”;
void main()
{
printf(str, 34, str, 34);
}
```

Answer: char *str = “char *str = %c%s%c; main()
{ printf(str, 34, str, 34);}”;
main(){ printf(str, 34, str, 34);}

11.
```
int main()
{
float a=3.15529;
printf(“%2.1f\n”, a);
return 0;
}
```

Answer: 3.2

12.
```
int main()
{
char *p;
p=”%d\n”; p++;
p++;
printf(p–2, 23);
return 0;
}
```

Answer: 23

13. int main()
```
{
printf("%%%%\n");
return 0;
}
```
Answer: %%

14. int main()
```
{
FILE *ptr;
char i;
ptr = fopen("myfile.c", "r");
while((i=fgetc(ptr))!=NULL)
printf("%c", i);
return 0;
}
```
Answer: infinite loop

15. int main()
```
{
int a=100;
printf("%1d\n", a);
return 0;
}
```
Answer: 100

16. void main()
```
{
int i,j;
printf("%d %d\n", scanf("%d", &i),scanf("%d",&j));
}
```

Answer: 1 1

17. What is the purpose of “rb” in the fopen() function used in the following code?

```
FILE *fp;
fp = fopen(“source.txt”, “rb”);
```

Answer: open “source.txt” in binary mode for reading

18. int main()

```
{
char *str;
str=”%s”;
printf(str,”s”);
}
```

Answer: S

19. Write output of the following:
Assuming that the array begins at the location 1002 and the size of an integer is 4 bytes. void main()

```
{
int a[3][4]={1,2,3,4,5,6,7,8,9,10,11,12};
printf(“%u %u %u”,a[0]+1,*{a[0]+1),*(*(a+0)+1));
}
```

Answer: 1006 2 2

20. void main()

```
{
char str1[20]=”Swati”, str2[20]=”Computers”;
printf(“%s”,strcpy(str2,strcat(str1,str2)));
}
```

Answer: SwatiComputers

21. void main()

```
{
printf(5+"good morning");
}
```

Answer: morning

22.
```
void main()
{
char str[] ="Jai\0Bharat\0";
printf("%s",str);
}
```

Answer: Jai

23.
```
void main()
{
Printf("%d %d %d", sizeof(3.0f), sizeof('3'),sizeof(3.0));
}
```

Answer: 4 2 8

24.
```
void main()
{
printf("%c\n", 7["SwatiComputers"]);
}
```

Answer: m

25.
```
int main()
{
char str[] = "peace";
char *s = str;
printf("%s\n", s++ +3);
return 0;
}
```

Answer: ce

26. int main() {
    int m = –10, n = 20;
    n = (m < 0) ? 0 : 1;
    printf(“%d %d”, m, n);
    }

Answer: –10 0

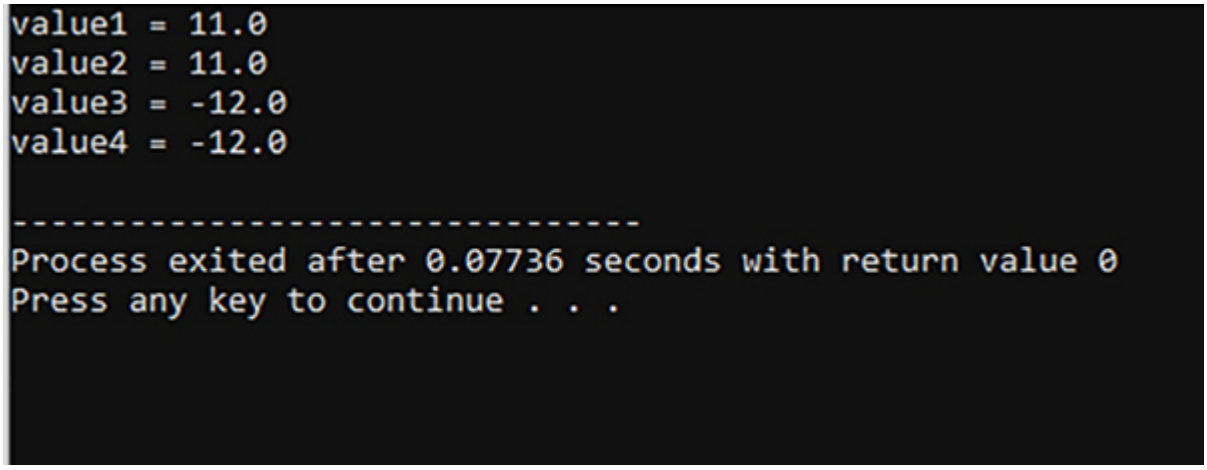
Math.h

1. double ceil(double x)

    It returns the smallest integer value greater than or equal to x.

```
#include <stdio.h>
#include <math.h>

int main ()
{
float val1, val2, val3, val4;

val1 = 10.6;
val2 = 10.2;
val3 = -12.8;
val4 = -12.3;

printf (“value1 = %.1lf\n”, ceil(val1));
printf (“value2 = %.1lf\n”, ceil(val2));
printf (“value3 = %.1lf\n”, ceil(val3));
printf (“value4 = %.1lf\n”, ceil(val4));

return(0);
}
```

Output



2. double floor(double x):

It returns the largest integer value less than or equal to x

```
#include <stdio.h>
#include <math.h>

int main ()
{
  float val1, val2, val3, val4;

  val1 = 11.6;
  val2 = 11.2;
  val3 = -12.8;
  val4 = -12.3;

  printf("Value1 = %.1lf\n", floor(val1));
  printf("Value2 = %.1lf\n", floor(val2));
  printf("Value3 = %.1lf\n", floor(val3));
  printf("Value4 = %.1lf\n", floor(val4));
```

```
  return(0);
}
```

Output

```
Value1 = 11.0
Value2 = 11.0
Value3 = -13.0
Value4 = -13.0

--------------------------------
Process exited after 0.3283 seconds with return value 0
Press any key to continue . . .
```

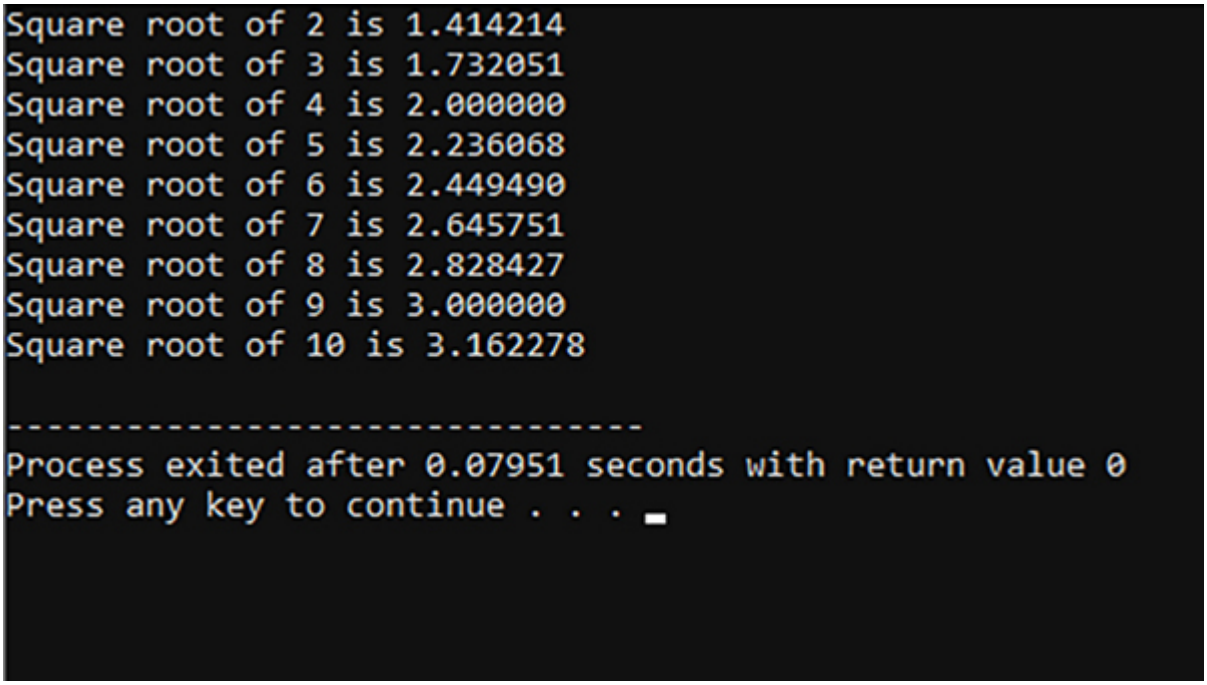
3. double sqrt(x)

The C library function double sqrt(double x) returns the square root of x.

Write a program to find the square root from 2 to 10?

```
#include <stdio.h>
#include <math.h>

int main ()
{
 int i;
 for(i=2;i<=10;i++)
 {
  printf("Square root of %d is %lf\n", i, sqrt(i) );
 }
  return(0);
}
```

Output



4. double pow(double x, double y):

   It returns x raised to the power of y i.e. xy.

   Write a program to calculate-

   22,23,24,25,26,27,28,29,210

   32,33,34,35,36,37,38,39,310

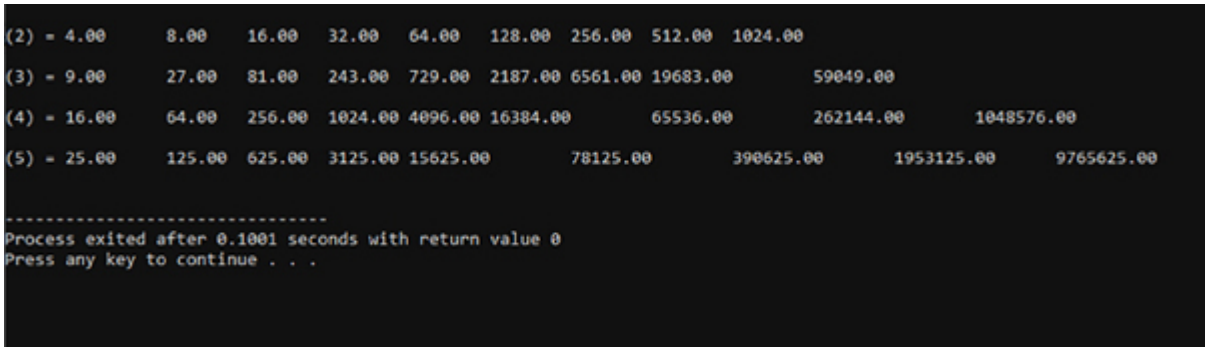
   42,43,44,45,46,47,48,49,410

   52,53,54,55,56,57,58,59,510

```
#include <stdio.h>
#include <math.h>

int main ()
{
 int i,j;
 for(i=2;i<=5;i++)
 {
```

```
  printf("\n(%d) = ",i);
  for(j=2;j<=10;j++)
  {
  printf("%.2lf\t", pow(i,j) );
   }
   printf("\n");
 }
 return(0);
}
```

Output



5. A father has given pocket money Rs 1200.50 to his child. Write a program to display how much rupee and coins (paisa) separately, he has given?

```
#include <stdio.h>
#include <math.h>

int main ()
{
 double money = 1200.50,paise,rupee;

   paise = modf(money, &rupee);
```

```
    printf ("Total Money: %.2lf\nRupee: %.2lf\nPaise: %.2lf", money,
rupee, paise);
  return(0);
 }
```

Output

```
Total Money: 1200.50
Rupee: 1200.00
Paise: 0.50
--------------------------------
Process exited after 0.1996 seconds with return value 0
Press any key to continue . . .
```

6. double floor(double x):

Itreturns the largest integer value less than or equal to x.

```
#include <stdio.h>
#include <math.h>

int main ()
{
 float val1, val2, val3, val4;

  val1 = 11.6;
  val2 = 11.2;
  val3 = -12.8;
  val4 = -12.3;

  printf("Value1 = %.1lf\n", floor(val1));
  printf("Value2 = %.1lf\n", floor(val2));
  printf("Value3 = %.1lf\n", floor(val3));
  printf("Value4 = %.1lf\n", floor(val4));
```

return(0);

}

Output

```
Value1 = 11.0
Value2 = 11.0
Value3 = -13.0
Value4 = -13.0

--------------------------------
Process exited after 0.09609 seconds with return value 0
```

7. double fabs(double x):

Itreturns the absolute value of x.

Write a program to print difference between cost price and sell price of item ?

```
#include <stdio.h>
#include <math.h>
 int main ()
{
float cp,sp,diff;

printf("Enter cost price\n");
scanf("%f",&cp);

printf("Enter sell price\n");
scanf("%f",&sp);

diff=sp-cp;

printf("\nCost Price %.2f",cp);
```

```
printf("\nSell Price %.2f",sp);
printf("\nDifference between cost price and sell price is
%.2lf",fabs(diff));

return(0);
}
```

Output

```
Enter cost price
1234
Enter sell price
987

Cost Price 1234.00
Sell Price 987.00
Difference between cost price and sell price is 247.00
--------------------------------
Process exited after 9.126 seconds with return value 0
Press any key to continue . . .
```

```
Enter cost price
1233
Enter sell price
1345

Cost Price 1233.00
Sell Price 1345.00
Difference between cost price and sell price is 112.00
--------------------------------
Process exited after 6.105 seconds with return value 0
Press any key to continue . . .
```

8. double exp(double x):

   It returns the value of e raised to the xth power.

```
#include <stdio.h>
#include <math.h>

int main ()
{
   double x = 0;

    printf("The exponential value of %.2lf is %.2lf\n", x, exp(x));
    printf("The exponential value of %.2lf is %.2lf\n", x+1, exp(x+1));
    printf("The exponential value of %.2lf is %.2lf\n", x+2, exp(x+2));
    return(0);
}
```

Output

```
The exponential value of 0.00 is 1.00
The exponential value of 1.00 is 2.72
The exponential value of 2.00 is 7.39

--------------------------------
Process exited after 0.07457 seconds with return value 0
Press any key to continue . . .
```

9. double log10(double x):

It returns the common logarithm (base-10 logarithm) of x

```
#include <stdio.h>
#include <math.h>

int main ()
{
double x, ret;
```

```
x = 10000;

/* finding value of log1010000 */
ret = log10(x);
printf("log10(%lf) = %lf\n", x, ret);

return(0);
}
```

Output

```
log10(10000.000000) = 4.000000

--------------------------------
Process exited after 0.1385 seconds with return value 0
Press any key to continue . . .
```

10.	sin(x)	sine of x (x in radian)	sin(0.0) is 0.0
11.	cos(x)	cosine of x (x in radian)	cos(0.0) is 1.0
12.	tan(x)	tangent of x (x in radian)	tan(0.0) is 0.0

```
#include <stdio.h>
#include <math.h>

int main ()
{
printf("%.2f\n",sin(0.0));
   printf("%.2f\n",cos(0.0));
   printf("%.2f\n",tan(0.0));
```

```
    printf("%.2f\n",sin(45.0));
    printf("%.2f\n",cos(45.0));
    printf("%.2f\n",tan(45.0));

     return(0);

}
```

Output

```
0.00
1.00
0.00
0.85
0.53
1.62

--------------------------------
Process exited after 0.07873 seconds with return value 0
Press any key to continue . . .
```

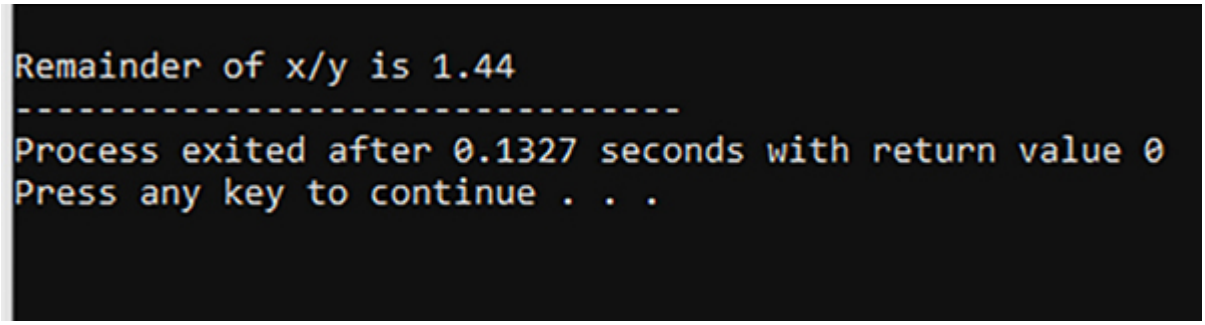
13. Write a program to find remainder as floating point number ?

```
#include <stdio.h>
#include <math.h>

int main ()
{
double x=12.34 , y= 5.45;

 printf("\nRemainder of x/y is %.2lf",fmod(x,y));
```

return(0);

}

Output



Ctype.h

isalnum	checks if a character is alphanumeric
isalpha	checks if a character is alphabetic
islower	checks if a character is lowercase
isupper	checks if a character is an uppercase character
isdigit	checks if a character is a digit
isxdigit	checks if a character is a hexadecimal character
isspace	checks if a character is a space character
isblank	checks if a character is a blank character

Write a program to describe above functions of ctype.h

#include<stdio.h>

#include<ctype.h>

int main()

{

char c=’A’,a=’4’,b=’#’,d=’A’;

```
printf("%c",tolower(c));
printf("\n%s",(isdigit(a))?"Digit":"not");
printf("\n%s",(isalpha(d))?"alphabet":"Not");
printf("\n%s",(isalnum(b))?"Alphanumeric":"Not");
return(0);
}
```

Extra Questions

27. What is preprocessor?

    The preprocessor is a program which is executed before the compilation of a source program written by the user. The preprocessor directives begines with hash (#) followed by the command. e.g #include – it is a directive to include file.

28. Describe functions used in dynamic memory allocation in C language?

    malloc()

    The malloc() function is used to allocate the memory during the execution of the program.

    It does not initialize the memory but carries the garbage value.

    It returns a null pointer if it could not be able to allocate the requested space.

    Syntax

    ptr = (cast-type*) malloc(byte-size) // allocating the memory using malloc() function.

    calloc()

    The calloc() is same as malloc() function, but the difference only is that it initializes the memory with zero value.

    Syntax

    ptr = (cast-type*)calloc(n, element-size);// allocating the memory using calloc() function.

    realloc()

    The realloc() function is used to reallocate the memory to the new size.

If sufficient space is not available in the memory, then the new block is allocated to accommodate the existing data.
Syntax

ptr = realloc(ptr, newsize); // updating the memory size using realloc() function.
In the above syntax, ptr is allocated to a new size.

free():The free() function releases the memory allocated by either calloc() or malloc() function.
Syntax

free(ptr); // memory is released using free() function.

Test Case based Question

1. Pooja would like to withdraw X Rs from an ATM. The cash machinewill only accept the transaction if X is a multiple of 5, and Pooja's account balance has enough cash to perform thewithdrawal transaction (including bank charges). For each successful withdrawal the bank charges 0.50 Rs.
   Calculate Pooja's account balance after an attempted transaction.
   Input
   Positive integer 0 < X <= 2000 - the amount of cash which Pooja wishes to withdraw.

   Non negative number 0<= Y <= 2000 with two digits of precision - Pooja's initial account balance.

   Output
   Output the account balance after the attempted transaction, given as a numberwith two digits of precision. If there is not enough money in the accountto complete the transaction, output the current bank balance.

   Example - Successful Transaction
   Input:
   30 120.00

   Output:
   89.50

Example - Incorrect Withdrawal Amount (not multiple of 5)
Input:
42 120.00

Output:
120.00
Example - Insufficient Funds
Input:
300 120.00

Output:

120.00

Solution :

```
#include <stdio.h>
int main() {
   int x;
   float y;
   scanf("%d %f",&x,&y);
   if(x%5==0 && y>=(x+0.5)) {
     y = y - x - 0.5;
     printf("%.2f", y);
   }
   else{
     printf("%.2f", y);
   }
   return 0;
}
```

```
300 500
199.50
--------------------------------
Process exited after 7.385 seconds with return value 0
Press any key to continue . . .
```

2. John loves to play with arrays by himself. Today, he has an array A consisting of N distinct integers.

   He wants to perform the following operation on his array A. Select a pair of adjacent integers and remove the larger one of these two. This decreases the array size by 1. Cost of this operation will be equal to the smaller of them.

   Input

   First line of input contains a single integer T denoting the number of test cases.

   First line of each test case starts with an integer N denoting the size of the array A.

   Next line of input contains N space separated integers, where the ith integer denotes the value Ai.

   Solution:

```
#include <stdio.h>

int main(void) {
   int t; scanf("%d",&t);
   while(t--)
   {
    unsigned int n,i;scanf("%u",&n);
    unsigned int a[n],max=0,smax=0;
    for(i=0;i<n;i++)
    {
       scanf("%u",&a[i]);
       if(max<a[i])
```

```
        {
           smax=max;
           max=a[i];
        }
        else if(a[i]>smax)
        {
        smax=a[i];
        }
}
printf("%u\n",smax);
}
 // your code goes here
   return 0;
}
```

3. Today is Jon's birthday. His mom has surprised him with truly fruity gifts:2 fruit baskets. The first basket contains N apples,and the second one contains M oranges. Jon likes apples and oranges very much buthe likes them equally, and therefore, wants to have the minimum possible difference between the number of apples and oranges he has.To do so, he can purchase 1 apple or 1 orange by paying exactly1 gold coin (that's some expensive fruit, eh?). Jon can purchase fruits at most K times (as he has only K gold coins in his pocket) to make the difference the minimum possible.Our little Jon is busy in celebrating his birthday to the fullest, and therefore,he has handed this job to his best friend — you. Can you help him byfinding the minimum possible difference he can achieve between the number of apples and orange he owns?

   Input

   The first line of input contains a single integer T denoting the number of test cases.

   The first and only line of each test case contains 3 space separatedintegers — N, M and K — denoting the number of apples, number of oranges, and number of gold coins our little Jon has.

Output
For each test case, output the minimum possible difference between the number of apples and oranges that Jon can achieve.

Constraints
1 = T = 100
1 = N, M, K = 100
Sample Input 1
3
3 4 1
5 2 1
3 4 3
Sample Output 1
0
2
0

Explanation
Test 1: Jon will buy 1 apple by paying 1 gold coin and will have equal number of apples and oranges.
Test 2: Jon will buy 1 orange by paying 1 gold coin and will have 5 apples and 3 oranges.

Solution:

```
#include<stdio.h>
int main()
{
int t,n,i,diff,m,w;
long intk;
scanf("%d",&t); //number of test case
for(i=1;i<=t;i++)
{
  scanf("%d",&n);//apple
```

```
scanf("%d",&m);//orange
scanf("%ld",&k);//coins
if(n>m)
 diff=n-m;
 else if(m>n)
 diff=m-n;
 else
 diff=0;

 printf("\nHe has %d apple , %d orange and %d coins",n,m,k);
 printf("\nThe difference is %d",diff);
 if(diff!=0)
 {
 if(k>=diff)
 {
 w=k-diff;
 printf("\nHe can purchase %d fruits",diff);
 }
 else if (k!=0 && k<diff)
 {
 w=diff-k;
 printf("\nHe has not enough coins so cannot purchase");
 }
 }
}
return 0;
}
```

4. Alice and Bob are playing a game. Alice initially has the number A and Bob has the number B. There are a total of N turns in the game, and Alice and Bob alternatively take turns. In each turn the player whose

turn it is, multiplies his or her number by 2. Alice has the first turn.Suppose after all the N turns, Alice's number has become C and Bob's number has become D. You want to calculate the integer division of the maximum number among C and D by the minimum number among C and D.max(c,d)/min(c,d).

Input

The first line of the input contains an integer T denoting the number of test cases.

The description of each testcase follows.

Each test case contains a single line with 3 integers A, B, and N.

Solution:

```
#include<stdio.h>
int main()
{
int t, A,B,turn;
int i,C,D,max,min,ans;

scanf("%d",&t);

   while(t--){

   scanf("%d",&A);
   scanf("%d",&B);
   scanf("%d",&turn);
   C=A;
   D=B;
   for(i=1;i<=turn;i++)
   {
      C=C*2;
      D=D*2;
   }
   printf("C=%d,D=%d",C,D);
   if(C>D)
```

```
    {
    max=C;
    min=D;
  }
    else
    {
    max=D;
    min=C;
    }
    ans=max/min;
    printf("\n%d/%d=%d",max,min,ans);
    }
}
```

5. Given an array of n integers and q queries, print the number of next greater elements to the right of the given index element. In Print Next Greater Number of Q queries problem we have given an array a[ ] of size n containing numbers and another array q[ ] of size m representing queries.Each query represents the index in array a[ ]. For each query, i print the number from the array a[ ]that is next greaterto the number at index q[i].

Input

a[ ] = {3, 4, 2, 7, 5, 8, 10, 6}

q[ ] = {3, 6, 1}

Output

8 -1 7

Solution:

```
#include<stdio.h>
void next_greatest(int a[], int n, int q[], int m){

   for(int i=0; i<m; i++){
```

```
        for(int j=q[i]+1; j<n; j++){

          if(a[j]>a[q[i]]){
              printf("%d ",a[j]);
              break;
          }

          if(j==n-1){
            printf("-1 ");
          }
        }
      }
    }
    int main(){
      int a[] = {3, 4, 2, 7, 5, 8, 10, 6};
      int n = sizeof(a) / sizeof(a[0]);

      int q[] = {3, 6, 1};
      int m = sizeof(q) / sizeof(q[0]);

      next_greatest(a, n, q, m);

      return 0;
    }
```

6. find the maximum for each and every contiguous subarray of size k.

   Input: arr[] = {1, 2, 3, 1, 4, 5, 2, 3, 6}, K = 3

   Output: 3 3 4 5 5 5 6

   Explanation:

Maximum of 1, 2, 3 is 3
Maximum of 2, 3, 1 is 3
Maximum of 3, 1, 4 is 4
Maximum of 1, 4, 5 is 5
Maximum of 4, 5, 2 is 5
Maximum of 5, 2, 3 is 5
Maximum of 2, 3, 6 is 6

Input: arr[] = {8, 5, 10, 7, 9, 4, 15, 12, 90, 13}, K = 4
Output: 10 10 10 15 15 90 90
Solution:

```
#include<stdio.h>
void printKMax(int arr[], int n, int k)
{
   int j, max;

   for (int i = 0; i <= n - k; i++)
   {
      max = arr[i];

      for (j = 1; j < k; j++)
      {
         if (arr[i + j] > max)
            max = arr[i + j];
      }
      printf("%d", max);
   }
}
```

```
int main()
{
int arr[10];
printf("\nEnter 10 elements of array");
for(int i=0;i<10;i++)
{
   scanf("%d",&arr[i]);
   }
int n = sizeof(arr) / sizeof(arr[0]);
int k ;
printf("\nEnter size");
scanf("%d",&k);
   printKMax(arr, n, k);
return 0;
}
```

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7. Ms. Jerry has given a challege to her students .She has given a list of N random integers and she wants to find the integer which has the maximum frequency in the given list.[1,4,3,2,3,2,1,2,5,2,3,4,3,2]
   In case Frequency of two numbers is same print the smaller one
   Input:
   First line of input contains N, number of integers.
   Second line will contains N spaces separated integers.
   Output:
   Print the most frequent integer

   Solution:

```
#include<stdio.h>
int main()
{
 int n,i,j;
```

```
scanf("%d",&n);
long int a[n],b,m=0,s;
for(i=0;i<n;i++)
{
  scanf("%ld",&a[i]);
}
for(i=0;i<n;i++)
{
  s=0;
   for(j=i;j<n;j++)
   {
     if(a[j]==a[i])
     s++;
  }
  if(s==m && a[i]<b)
     b=a[i];
  if(s>m)
  {
  m=s;
  b=a[i];
  }
 }
 printf("%d",b);
}
```

8. Tom and Jerrry works in a building construction, they have to put some number of bricks N from one place to another, and started doing their work. They decided , they end up with a fun challenge who will put the last brick.They to follow a simple rule, In the i'th round, Tom puts i bricks whereas Jerry puts i x 2 bricks.There are only N bricks, you need to help find the challenge result to find who put the last brick.

Input:
First line contains an integer N..
Solution:

```
#include<stdio.h>
   int main()
   {
    int n,p,m,i=1;
    scanf("%d",&n);
    while(i<=n)
    {
     if(n>=i)
     {
      p=i;
      n=n-p;
     }
     else
     p=n;
     if(n>=2*i)
     {
      m=i*2;
      n=n-m;
     }
    else
     m=n;
    i++;
    }
    if(p>m)
     printf("Jerry");
    else
     printf("Tom");
```

```
    return 0;
  }
```

9. Johny's birthday is in next month. This time he is planning to invite N of his friends. He wants to distribute some chocolates to all of his friends after party. He went to a shop to buy a packet of chocolates.At chocolate shop, each packet is having different number of chocolates. He wants to buy such a packet which contains number of chocolates, which can be distributed equally among all of his friends.Help Johny to buy such a packet.

Input:

First line contains T, number of test cases.

Each test case contains two integers, N and M. where is N is number of friends and M is number number of chocolates in a packet.

Output:

In each test case output "Yes" if he can buy that packet and "No" if he can't buy that packet.

Constraints:

1<=T<=20

1<=N<=100

1<=M<=10^5

Solution:

```
#include<stdio.h>
int main()
{
  int t,n,i;
  long int m;
  scanf("%d",&t); //number of test case
  for(i=1;i<=t;i++)
  {
    scanf("%d",&n);//friends
    scanf("%ld",&m);//number of chocolates
    if(m%n==0)
```

```
    printf("Yes\n");
  else
   printf("No\n");
  }
  return 0;
}
```

10. Program to check if a given number is Lucky.
A number is lucky if all digits of the number are different.

Solution:

```
#include<stdio.h>
bool isLucky(int n)
{
   // Create an array of size 10 and initialize all
   // elements as false. This array is used to check
   // if a digit is already seen or not.
   bool arr[10];
   for (int i=0; i<10; i++)
     arr[i] = false;

   // Traverse through all digits of given number
   while (n > 0)
   {
     // Find the last digit
     int digit = n%10;

     // If digit is already seen, return false
     if (arr[digit])
      return false;
```

```
        // Mark this digit as seen
        arr[digit] = true;

        // REmove the last digit from number
        n = n/10;
    }
    return true;
}

// Driver program to test above function.
int main()
{
int arr[5] ;
printf("Enter 5 numbers");
    for(int i=0;i<5;i++)
{
    scanf("%d",&arr[i]);
    }
int n = sizeof(arr)/sizeof(arr[0]);

for (int i=0; i<n; i++)
    isLucky(arr[i])? printf("\n%d is lucky", arr[i]):
        printf("\n%d is not lucky", arr[i] );
  return 0;
}
```

Dynamic Memory Allocation using structure

As you know array is used to store more elements of similar type on contiguous memory locations. Insertion and deletion of elements in array is not very easy.

Therefore, C Dynamic Memory Allocation can be defined as a procedure in which the size of a data structure (like Array) is changed during the runtime.

C provides some functions to achieve these tasks. There are four library functions provided by C defined under <stdlib.h> header file to facilitate dynamic memory allocation in C programming. They are:

malloc()

calloc()

free()

realloc()

Function	**Syntax**	**Description**
malloc()	ptr = (cast-type*) malloc(byte-size)	method in C is used to dynamically allocate a single large block of memory with the specified size. It returns a pointer of type void which can be cast into a pointer of any form.
calloc()	ptr = (cast-type*)calloc(n, element-size);	method in C is used to dynamically allocate the specified number of blocks of memory of the specified type. it is very much similar to malloc()
free()	free(ptr);	method in C is used to dynamically **de-allocate** the memory. The memory allocated using functions malloc() and calloc() is not de-allocated on their own.
realloc()	ptr = realloc(ptr, newSize);	method in C is used to dynamically change the memory allocation of a

		previously allocated memory

1. Write a program to check whether a given string is palindrome or not using dynamic memory allocation?

   Solution:

```
#include <malloc.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

char* stack;
int top = -1;
// push function
void push(char ele)
{
   stack[++top] = ele;
}

// pop function
char pop()
{
   return stack[top--];
}
int isPalindrome(char str[])
{
   int length = strlen(str);

  // Allocating the memory for the stack
   stack = (char*)malloc(length * sizeof(char));
```

```
  // Finding the mid
    int i, mid = length / 2;
    for (i = 0; i < mid; i++) {
        push(str[i]);
    }

    if (length % 2 != 0) {
        i++;
    }

    // While not the end of the string
    while (str[i] != '\0') {
        char ele = pop();

        if (ele != str[i])
            return 0;
        i++;
    }

    return 1;
}

int main()
{
    char str[] = "madam";

    if (isPalindrome(str)) {
        printf("Yes");
    }
```

```
    else {
       printf("No");
    }

    return 0;
}
```

2. Write a C program to calculate sum of first 10 numbers, using calloc().

Solution:

```
#include <stdio.h>
#include<stdlib.h>
 int main() {
   int i, * ptr, sum = 0;
   ptr = (int *)calloc(10, sizeof(int));
   if (ptr == NULL) {
     printf("Error! memory not allocated.");
     exit(0);
   }
   printf("Building and calculating the sequence sum of the first 10
terms \n ");
   for (i = 0; i < 10; ++i) { * (ptr + i) = i;
     sum += * (ptr + i);
   }
   printf("Sum = %d", sum);
   free(ptr);
   return 0;
}
```

3. Enter marks of students as you needed , using realloc() dynamic memory allocation?

Solution:

```
#include <stdio.h>
#include <stdlib.h>
int main()
{
    int index = 0, i = 0, n,
        *marks; // this marks pointer hold the base address

    int ans;
    marks = (int*)malloc(sizeof(int)); // dynamically allocate memory
using malloc

    if (marks == NULL) {
        printf("memory cannot be allocated");
    }
    else {
        // memory has successfully allocated
        printf("Memory has been successfully allocated by "
          "using malloc\n");
        printf("\n marks = %pc\n",
          marks); // print the base or beginning
              // address of allocated memory
    do {
    printf("\n Enter Marks\n");
    scanf("%d", &marks[index]); // Get the marks
    printf("would you like to add more(1/0): ");
    scanf("%d", &ans);

    if (ans == 1) {
      index++;
      marks = (int*)realloc(marks,(index + 1)* sizeof(int));
```

```
        if (marks == NULL) {
          printf("memory cannot be allocated");
        }
        else {
          printf("Memory has been successfully "
            "reallocated using realloc:\n");
          printf("\n base address of marks are:%pc",marks); ////print the base
or
                    ///beginning address of
                    ///allocated memory
        }
      }
    } while (ans == 1);
    // print the marks of the students
      for (i = 0; i <= index; i++) {
          printf("marks of students %d are: %d\n ", i,
            marks[i]);
      }
      free(marks);
  }
  return 0;
  }
```

4. Write a program to create a stack of numbers using dynamic memory allocation in C?

```
#include <stdio.h>
#include <stdlib.h>
void push();
void pop();
void display();
```

```
struct node
{
int val;
struct node *next;
};
struct node *head;

int main ()
{
   int choice=0;
printf("\n*********Stack operations using linked list*********\n");
 printf("\n----------------------------------------\n");
 while(choice != 4)
 {
   printf("\n\nChose one from the below options...\n");
   printf("\n1.Push\n2.Pop\n3.Show\n4.Exit");
   printf("\n Enter your choice \n");
   scanf("%d",&choice);
   switch(choice)
   {
     case 1:
     {
       push();
       break;
     }
     case 2:
     {
       pop();
       break;
```

```
      }
      case 3:
      {
        display();
        break;
      }
      case 4:
      {
        printf("Exiting....");
        break;
      }
      default:
      {
        printf("Please Enter valid choice ");
      }
    };
}
}
void push ()
{
    int val;
    struct node *ptr = (struct node*)malloc(sizeof(struct node));
    if(ptr == NULL)
    {
      printf("not able to push the element");
    }
    else
    {
      printf("Enter number \n");
```

```
      scanf("%d",&val);
      if(head==NULL)
      {
        ptr->val = val;
        ptr -> next = NULL;
        head=ptr;
      }
      else
      {
        ptr->val = val;
        ptr->next = head;
        head=ptr;

}
      printf("Item pushed");

    }
}

void pop()
{
    int item;
    struct node *ptr;
    if (head == NULL)
    {
      printf("Underflow");
    }
    else
    {
```

```
      item = head->val;
      ptr = head;
      head = head->next;
      free(ptr);
      printf("Item popped");

    }
}
void display()
{
    int i;
    struct node *ptr;
    ptr=head;
    if(ptr == NULL)
    {
      printf("Stack is empty\n");
    }
    else
    {
      printf("Printing Stack elements \n");
      while(ptr!=NULL)
      {
        printf("%d\n",ptr->val);
        ptr = ptr->next;
      }
    }
}
```